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Automobile Dealer and Repairer



A JOURNAL OF PRACTICAL MOTORING
REGISTERED IN U. S. PATENT OFFICE.
THE MOTOR VEHICLE PUBLISHING CO., 24 Murray Street, New York.

Vol. 11. No. 1.

NEW YORK, MARCH, 1911.

Monthly, \$1.00 per year.
Single Copy, 10 Cents.

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Panhard Oil is a common sense oil. Intended first to lubricate, it possesses freedom from carbon but is not filtered so excessively as to remove both the carbon impurities and the lubricating body. It is the oil combining freedom from carbon with heavy lubricating body and lightness of color. It is intended to give maximum efficiency and long life to the automobile.

The advantage to the dealer of selling an oil of such great benefit to his patrons will at once be evident. May we send you some copies of our new booklet, "Motor Lubrication?" It contains up-to-date information on the lubricating problem of much interest both to dealer and owner.

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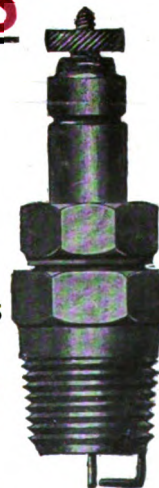
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A PLUG WITH A RECORD

THE BENFORD CO., Mt. Vernon, N. Y.

BUYERS' GUIDE AND INDEX TO ADVERTISEMENTS, PAGES 80 AND 81
The Table of Contents will be found on Page 104

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Little Giant.

Wells Brothers Company
Greenfield, Mass., U. S. A.

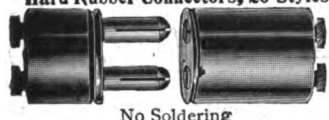
Is Your Garage Properly Equipped

for repairing and cutting A. L. A. M. standard threads?

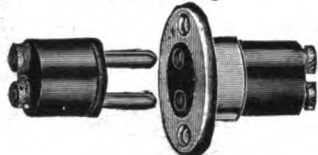
Put up in neat cases, with taps, dies, stocks and tap wrenches, **LITTLE GIANT** A. L. A. M. Screw Plates will give you high grade tools for high class work.

Have your Dealer furnish you with Catalogs.

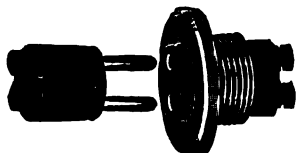
Largest Line Automobile and Motor Boat Lighting Accessories, Consisting of Lamps, Switches, Sockets, Terminals and Hard Rubber Connectors
Hard Rubber Connectors, 20 Styles



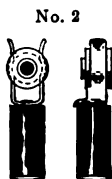
No Soldering



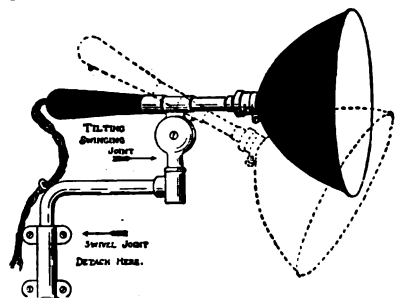
No Set Screws



No Working Loose



Primary and Secondary



No. 21A Search Lamp throws Light 200 Feet.

Send for Illustrated Price List

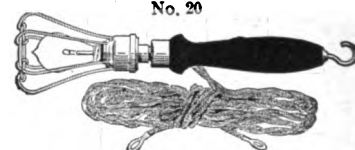
FRANK W. MORSE,
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Terminals



No. 20



No. 24



No. 22



Style No. 23

463

This is the whole number of vehicles exhibited
Madison Square Garden **Grand Central Palace**
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463

Trade **VALENTINES** Mark

70%+

This large percentage of all vehicles employed
Valentine's Products

70%+

"SILVER KING"



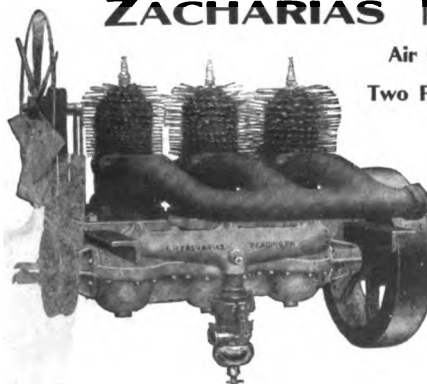
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The handle will swing in any position required, to dodge obstacles, making it possible to work in places where no other wrench can be used.

Ask your jobber for
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Air Cooled 20-22 H.P.

Two Port and Three Port.
Two Cycle.

Construction is simple, durable, absolutely reliable, and smooth running.

All work thoroughly tested, and perfect satisfaction guaranteed.

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Would You Enjoy an Automobile Supply Exposition at Which Were Shown All the Latest and Best Supplies for an Automobile? Then Write Us To-day for Our Free Illustrated Catalogue.

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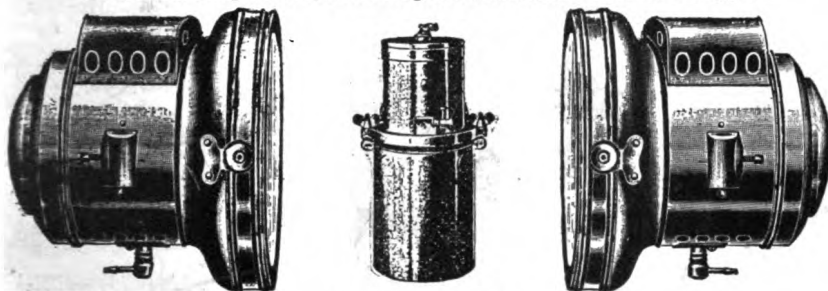
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Look through this list of articles carefully. You may buy as many as you please; your local Automobile Supply Dealers may carry some of these goods. COMPARE OUR PRICES with theirs and SEE HOW MUCH WE SAVE YOU.

"The Only" Flaring Front Searchlight Sets

These Searchlights are of the Regular Standard Flared Front type.



10.25 PER SET

12.00 PER SET

13.25 PER SET

A POWERFUL LIGHT PROJECTOR, a rich looking lamp set made up in the finest and most substantial manner, from heavy 22 gauge brass, highly finished and polished. The different parts of these lamps are screwed and bolted together, no solder being used in the assembling, thereby allowing the doors and the lens mirror to be easily removed. The generator is made of extra heavy drawn seamless brass, strong and substantial, simple to operate, and does not get out of order.

NOTHING FINER MADE BY ANYONE AT ANY PRICE

Set No. 1201 consists of the following:

TWO LAMPS			
Diameter of Door	Distance between Props		Diameter of Mirror Lens
8¾ inch	7 inch		6 inch
ONE GENERATOR			
Height	Width	Capacity	Will light
15 inch	8 inch	3½ lbs.	2 Lamps
	12 Feet of Tubing.		7 to 8 hrs.

Set No. 1201 complete. Reg. Price, \$30.00; Cut Price, **\$12.00**

Set No. 1205 consists of the following:

TWO LAMPS			
Diameter of Door	Distance between Props		Diameter of Mirror Lens
9 3/4 inch	8 inch		7 inch
ONE GENERATOR			
Height	Width	Capacity	Will Light
15 inch	8 inch	3 1/2 lbs.	2 Lamps
12 Feet of Tubing.			7 to 8 hrs.

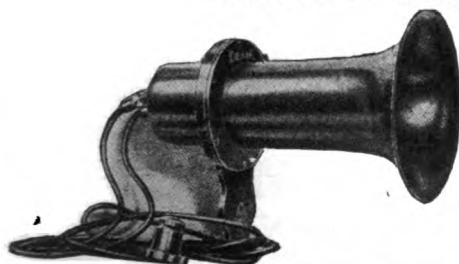
Set No. 1205 complete. Reg. Price, \$40.00; Cut Price, **\$13.25**

Set No. 1210 consists of the following:

TWO LAMPS		ONE GENERATOR				
Diameter of Door	Distance between Props	Diameter of Mirror Lens	Height	Width	Capacity	Will Light 2 Lamps
7¾ inch	6½ inch	5 inch	12¼ inch	6¼ inch	2 lbs.	5 to 6 hrs.
12 Feet of Tubing.						

Set No. 1210 complete. Reg. Price, \$25.00; Cut Price, **\$10.25**

National Electric Horns



The "National" Horn is the quickest operating electrical noise-producing device ever made, owing to the fact of its being a vibrator horn.

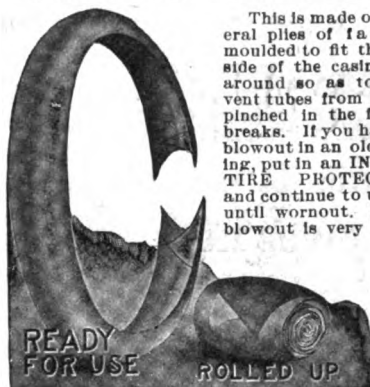
It uses one-tenth the current of any other Electric Horn. Four dry cells or the same cells that start your car will successfully operate it.

The sound produced by the "National" is far reaching and not unpleasant to the ear.

Furnished complete with wire and push button for steering wheel or foot board.

No. 2301. Reg. Price, \$15.00; Cut Price, **\$10.25**

Inside Tire Protector



This is made of several plies of fabric moulded to fit the inside of the casing all around so as to prevent tubes from being pinched in the fabric breaks. If you have a blowout in an old casing, put in an INSIDE TIRE PROTECTOR and continue to use it until worn out. If the blowout is very large

it can be reinforced with an extra Reinforced Blowout Patch at this point. In this manner the tires can be used until they are completely gone. The INSIDE TIRE PROTECTOR can be removed and used in other casings.

No.	Size	Reg. Price Each	Cut Price Each
9101	28x3 in.	\$ 6.00	\$3.70
9102	30x3 in.	6.45	2.92
9103	32x3 in.	6.65	3.13
9105	30x3 1/2 in.	7.15	3.37
9106	31x3 1/2 in.	7.20	3.45
9107	32x3 1/2 in.	7.25	3.52
9108	34x3 1/2 in.	7.35	3.75
9109	36x3 1/2 in.	7.50	4.05
9110	30x4 in.	8.00	4.12
9111	31x4 in.	8.20	4.27
9112	32x3 in.	8.30	4.35
9113	33x4 in.	8.40	4.42
9114	34x4 in.	8.50	4.50
9115	36x4 in.	8.75	4.65
9116	32x4 1/2 in.	9.00	4.80
9117	34x4 1/2 in.	9.25	4.95
9118	35x4 1/2 in.	9.75	5.05
9119	36x4 1/2 in.	10.00	5.10
9120	34x5 in.	11.50	5.40
9121	36x5 in.	13.00	5.82
9122	36x5 1/2 in.	13.50	6.00
9123	38x5 1/2 in.	14.25	6.75
9124	38x6 in.	15.00	7.15



National Self-Vulcanizing Patches

National Self-Vulcanizing Patches are made of heavy vulcanized rubber with tapered edges and lined with a layer of especially prepared rubber which is self-vulcanizing in nature and acts the same as high-grade cement carefully applied to the patch. All that is necessary is to clean tube thoroughly, moisten patch and tube with gasoline and press firmly together. Inner tubes can be repaired in less than one-fourth the time ordinarily required, without experience or practice. Regular outfit consists of eight patches, sandpaper and sheeting, all packed in neat, substantial box, with full directions for use printed on same. No. 8150. Reg. Price, \$1.00; Cut Price, **\$0.48**

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Cotton fabric is the very backbone of an automobile Tire. Rubber receives the outside wear and gives necessary elasticity, but it is the Fabric that resists pressure, strains and shocks. To get fabric of the necessary strength and uniformity for

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we pay more for it than we would have to pay for many grades of *silk*.

Less than *one* per cent of the entire American cotton crop possesses the *length* and *strength* of staple that permits its use as a source of supply for our tire fabric. Furthermore, every inch of the finished fabric is closely inspected to eliminate the slightest possibility of weakness.

It is this eternal vigilance at the factory end that has justified the users' faith in Goodrich Tires and made them the Standard Automobile Tires of America.



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Largest in the World

Branches in
the principal cities.

Wholesale tire
depots everywhere.



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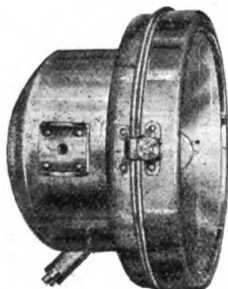
and any other car without Magneto or with
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Throw Off That Gas Tank or Generator

Get acquainted with the new Idea in Road
Lighting.

ELECTRIC LIGHTS

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THE K-W ROAD LIGHTING OUTFIT—
Magneto, pair of Head Lamps, Switch, Wire and
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K-W Electric Head Lights exceed any gas
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get an abundance of light.

K-W belt or friction drive Magnetos run the
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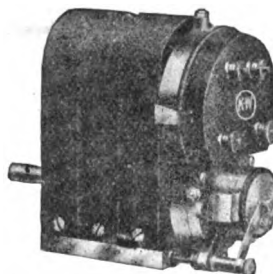
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is guaranteed to start and run the engine without
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Write for
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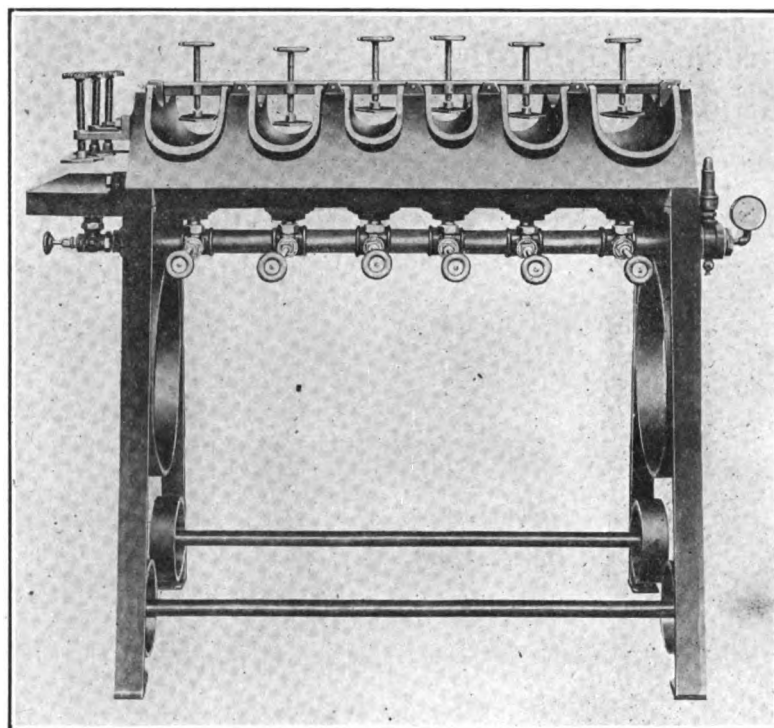
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PATENT APPLIED FOR.

Money Rolls
Into Your Till
Fast Enough
to Pay for
the Machine in
Ten Hours.

Any Size Casing
can be Repaired
at Less Cost
and in Less Time
than on any
other Vulcanizer.



Steam Applied
Independently
to Any One or
Any Group of
Sections
as Required.

Furnished as
shown with
Full Set of
Bead Molds
for All Sizes.

Write for the
Rest of the Story
and do it Now.

BUILT FOR INDEPENDENT STEAM GENERATION
OR ATTACHMENT TO STEAM BOILER.

THE BAUM IRON COMPANY, OMAHA, NEB.

Makers of Vulcanizers of Merit.

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Will You "Hold the Sack" Again?

There have been many imitations of the Prest-O-Lite Gas Tank.

But most of the imitations went out of business, leaving their dealer friends to "hold the sack," with a lot of tanks that could neither be sold nor re-filled.

And there will be other imitators—

Likewise, other dealers that will "take a chance." But

You Take No Chances on Prest-O-Lite

It's the tank your customer wants.

It's the tank that, when empty, can be promptly exchanged for a full one, **anywhere and always.**

Prest-O-Lite has been a big **money-maker** for dealers.

Imitations have invariably been **money-losers** for dealers.

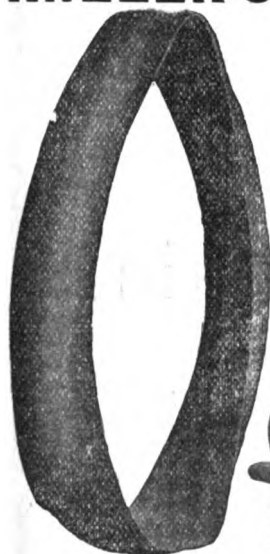
IT'S UP TO YOU

The Prest-O-Lite Co., 251 East South Street,
Indianapolis, Ind.

BRANCHES at New York, Astoria, Boston, E. Cambridge, Providence, Philadelphia, Pittsburg, Cleveland, Cincinnati, Detroit, Chicago, Milwaukee, Minneapolis, Kansas City, Omaha, Dallas, Los Angeles, San Francisco, Emeryville, Baltimore and Seattle.

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MILLER'S VULCANIZERS AND TIRE RELINERS.



Miller's Tire Reliners.

Are made of three and four ply 19 ounce tire fabric, vulcanized in shape to lay on the inside of the casing, extended clear around to strengthen same. Can either be cemented in or laid in loose and makes the tire difficult to puncture, also reinforces weak casings. Packed neatly one in a box at the following prices:



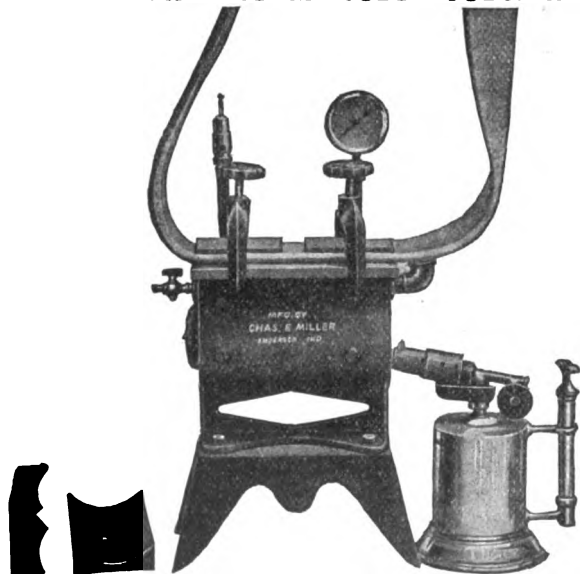
PRICES.

	Each		Each		Each
28x2 1/2 inches,	\$2.64	36x8 1/2 inches,	\$4.56	34x4 1/2 inches,	\$6.72
28x3	3.80	30x4	5.16	35x4 1/2	6.84
30x3	3.42	31x4	5.28	36x4 1/2	6.96
32x3	3.54	32x4	5.40	37x4 1/2	7.14
28x3 1/2	3.69	33x4	5.52	38x4 1/2	7.26
28x3 3/4	3.96	34x4	5.70	34x5	7.56
30x3 1/2	4.08	35x4	5.82	35x5	7.74
31x3 1/2	4.14	36x4	5.94	36x5	7.92
32x3 1/2	4.20	40x4	6.60	37x5	8.10
34x3 1/2	4.38	32x4 1/2	6.60	38x5 1/2	9.84

If you want liners made of 14 oz. cloth instead of 19 oz. you may deduct 20 per cent from these prices.

If interested in bicycle or automobile tires, either first or second quality or second hand, write for prices.

MILLER'S NEW STEAM TUBE VULCANIZER.



The above is a new steam tube vulcanizer that we are just placing on the market. It is especially adapted for repairing automobile inner tubes. Has a machine surface 5x19 inches, and will repair two tubes at one time. The steam is generated from a common blow torch flame, which passes through a fine 20 inches in length, giving heat surface sufficient to generate 40 pounds of steam in ten minutes. It is furnished complete by us, with pop valve, steam gauge, 2 clamps, base and gasoline blow torch for \$15.00; without blow torch, \$12.50. Jobbers who wish to catalog same, write for cuts.

CHARLES E. MILLER, Anderson, Ind.

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Miller's Circular Lock Patch.

Is made of heavy tire cloth vulcanized to encircle the inner tube and formed to the natural shape of the inside of a tire. By encircling the inner tube you get much greater efficiency than it is possible to get by laying the patch over a hole in the casing. You can also use this patch for a rim cut as there is a thin edge which can be brought around under the tire, giving great strength at this point.

PRICES.

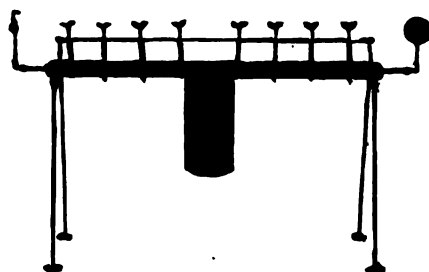
2 1/2 inches, each	\$0.78	3 1/2 inches, each	\$1.08	4 1/2 inches, each	\$1.38
3 inches, each	.90	4 inches, each	1.20	5 inches, each	1.50

Miller's Inner Tube Patches and Valve Seats.

Made of good grade rubber and in all sizes. Where extra large quantities are ordered can put the customer's name on patch.

Price, \$2.50 per Pound.

Miller's Inner Tube Vulcanizer.

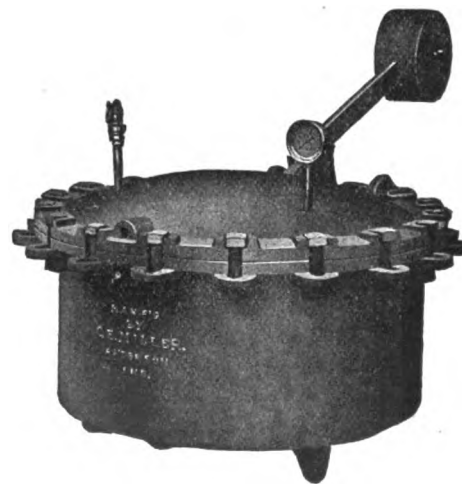


Has a tube plate 54 in. long and 4 in. wide with plain surface highly polished, complete with stand, 12 fine boiler, gas burner, water glass, pop valve, steam gauge, 8 clamps and two molds for curing the treads of casings, price \$25.00; gasoline burner \$2.50 extra. Tube plate only with steam

gauge and 6 clamps, price \$10.00.

We also manufacture various other vulcanizers. No. 1 and No. 2 adjustable sectional vulcanizers, complete with boiler, \$35.00 each. Bicycle vulcanizers, \$7.50; Motor cycle vulcanizers, \$12.50; Tread Rollers, \$12.00; Kettles, \$115.00; Power wrapping machines, \$175.00 each. We do all kinds of tire repairing and carry a large stock of tires at reasonable prices. If further interested in vulcanizers write for catalog and special proposition.

MILLER'S KETTLE VULCANIZER.



This kettle vulcanizer is made in two sizes; small size weighs 2000 lbs., holds from 5 to 8 tires at one time, up to 38 inches. Price, \$115.

Large size weighs 2500 lbs., holds from 7 to 10 tires at one time, up to 44 inches. Price, \$150.

If you are interested in other styles of vulcanizers write today for our catalog, showing 27 different kinds we make. We also manufacture a full line of repair materials.

Write for samples and prices. They are interesting.

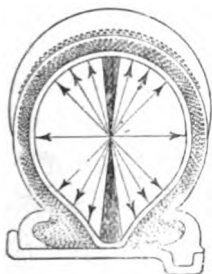
Look to What Counts Most—

what determines the service you will get for your money. It is the Quality and Quantity of materials used, workmanship employed and the knowledge and character of the men behind the guns.

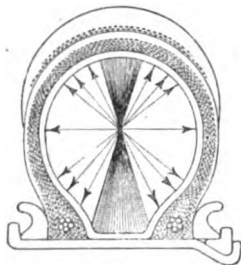
Diamond Tires

IN THEIR TWELFTH TRIUMPHAL YEAR HAVE YET TO OFFER A FEATURE
ADOPTED FOR ADVERTISING PURPOSES.

A CORRECT PRESENTATION OF THE CLINCHER AND STRAIGHT SIDE TIRE SUBJECT.



Diamond
Quick Detachable
Clincher Tire and Rim



Diamond
Straight Side or Hotchkiss Tire and Rim
Also called Mechanical type and Dunlop type

Arrows in both tires show counterbalanced lines of pressure. The black portions show that part of each tire in which this pressure is not balanced.

THE RELATIVE MERITS of these tires differing only in method of attachment, have never been correctly presented so far as we know. We wish to correct some of the misapprehensions and misrepresentations heretofore current.

THE CLINCHER AUTOMOBILE TIRE IS THE STANDARD OF THE WORLD. With ten years of development by the leading manufacturers, it stands today a faultless construction. The principal of utilization of inflation pressure for retention on the rim is mechanically correct. The radial lines of force tending to cause the tire to leave the rim are nearly counterbalanced by similar forces tending to keep it on the rim. The unbalanced, or destructive force (shown in black in the cuts above), is relatively slight, thereby reducing the strain on the beads to a minimum easily within their capacity. The lateral lines of force in a properly designed clincher tire are all active in keeping the tire beads engaged in the hooks of the rim.

WE EMPHASIZE "PROPERLY DESIGNED" because it is readily seen that if a tire is out of balance—that is, too large in cross section for the rim—the active forces will not balance perfectly. In a properly designed clincher tire, inflation but increases the force holding the tire on the rim.

DIAMOND TIRES ARE MADE IN BOTH CLINCHER AND STRAIGHT SIDE TYPES.

NO INHERENT POINTS in the construction of the Straight Side tire prevents its production in first-class quality. This type has never equaled the leading clincher tires because its sales have been almost exclusively to builders of low-priced cars, unwilling to pay the price for Diamond quality.

AS TO SIZES—Note that the Straight Side rim has

a wider base between the flanges than the clincher rim. Therefore, a given amount of tire material will enclose greater air space. We do not wish to deceive the public, however. This difference does not mean more high cost materials, it means more inexpensive air, and the carrying capacity of a Straight Side tire is exactly the same as that of a clincher tire of a corresponding size.

The Straight Side Tire is retained on the rim by bands of the finest piano wire, of tremendous strength, which is necessary, as the strains in this tire are unbalanced strains. These braided wire bands are rigid. They neither stretch nor constrict to grip the rim, nor do those of any other tire manufacturer constrict. Frictional contact under pressure of inflation prevents "creeping."

THE DIAMOND STRAIGHT SIDE TIRE IS THE BEST OF ITS KIND, built with a clear understanding of the principles involved, not for the purpose of securing initial equipment orders at a low price.

RIM CUTTING IS SOMETHING WHICH NOW FIGURES MORE LARGELY IN ADVERTISING MATTER than in cost to the tire user. It is caused by imperfectly fitting tires in either the clincher or straight side type. Rim cutting is not ordinarily one of the results of riding tires deflated, but instead, bruises and loosening of the tread are likely to result. We do not guarantee tires not to be injured by deflated running nor does any manufacturer.

PATENTS—Neither the clincher tire nor the Straight Side tire is covered or controlled by any valid patent.

TIRE SIZES—SO-CALLED "OVERSIZE" AND OTHER NOVELTIES

WE WISH IT DISTINCTLY UNDERSTOOD that Diamond tires are neither oversize nor undersize. Their size is not determined for advertising purposes and should not be. It is fixed intelligently and scientifically by engineers who know, and Diamond tires are all the right size for their respective rim sizes. There is no larger Straight Side tire than the Diamond. But we have frankly told you this means not more rubber, but more air.

The point is that you must not fix your attention on immaterial or misleading things. An inferior tire with a thin wearing surface is a poor thing at any price—no matter how attached to the rim or how much "oversize."

WHAT COUNTS MOST, costs the manufacturer most and determines the service you get, is quality and quantity of materials used and the knowledge and character of the men behind the guns.

It means more to you that we offer tires containing better rubber, more rubber, thicker treads—tires that will last longer, puncture less easily, stone bruise rarely—than that we give you a little larger tire, if the latter means only a little more air.

Ask for Booklet "CC." It's worth while.

THE DIAMOND RUBBER COMPANY, AKRON, OHIO, AND ALL PRINCIPAL CITIES

Please mention the Automobile Dealer and Repairer when writing to advertisers.

2,000 Miles on Six Dry Cells

That's what Delco Ignition will do on your car.

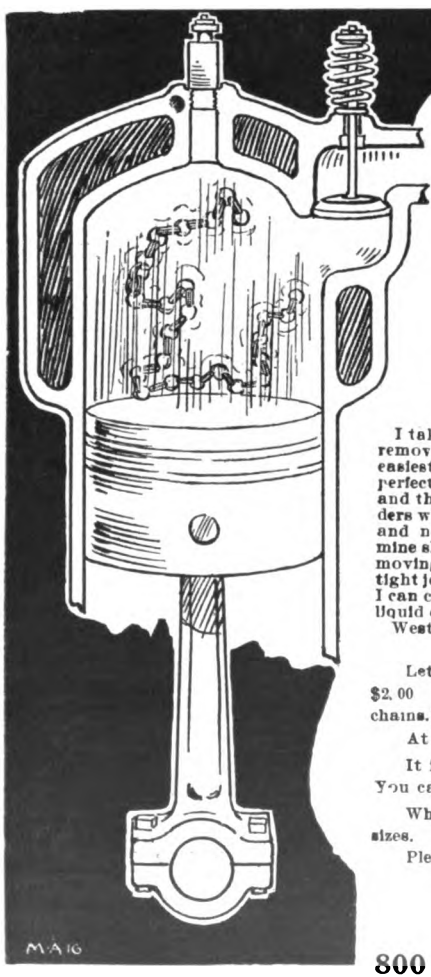
Most economical and reliable system made

Runs 10,000 miles without adjustment.

WRITE FOR PARTICULARS

Kellogg Switchboard & Supply Co.

Congress and Green Streets, Chicago



MICHENER'S

Chain Carbon Remover

does more than any other kind—it actually cleans out all the carbon, from the pistons, top and sides of cylinders.

It is a flexible coil Chain made of unusually tough, soft wire, which is as flexible as a piece of twine and absolutely harmless to the "insides" of your motor.

Just poke it through a spark plug hole, inject a little kerosene. Screw back the spark plug and cut off the ignition on the cylinder being treated—then run the engine about two minutes.

CHALMERS. Rome, Ga.

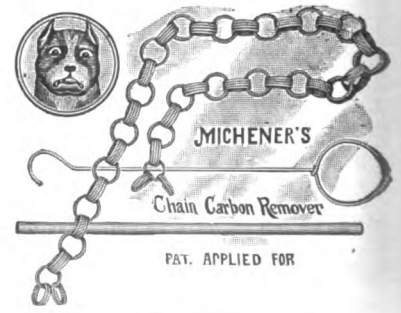
I take great pleasure in saying that of all the Carbon removers I have tried, liquids included, this one is the easiest to use and most efficient of them all. It cleans perfectly the piston head, top and sides of cylinders and the head of intake valve. The "L" part of cylinders where the chain can not reach is very accessible, and no trouble to scrape. Any owner of a car like mine should appreciate a device which will eliminate removing the intake valve cages and disturbing an air tight joint difficult to secure again. With your "Chain" I can clean four cylinders perfectly in less time than any liquid carbon remover can partially clean one.

West Building. Dr. WILLIAM WINSTON, Dentist.

REO. Knoxville, Tenn.

Referring to the "Chain" Carbon Remover, which I recently purchased from you, I beg to say that I have used same on my REO "20" four cylinder touring car, and find that it cleaned the cylinders thoroughly. Before using your "Chain" I found considerable difficulty in negotiating hills of any consequence at high speed, and was compelled usually to go into second and sometimes low in order to get up. After cleaning the cylinders, however, which took me about thirty minutes, I observed a marked difference in the power developed.

CHAR. T. LEONARDT,
Sec'y and Treas., Knoxville Cotton Mills.



MICHENER'S
Chain Carbon Remover
PAT. APPLIED FOR

Let us send you one postpaid by return mail for 75c., or 3 for \$2.00 (You can clean two cylinders at the same time with two chains.)

At least get our booklet of testimonials and further description. It is the most practical tool you can carry in your tool kit. You can use it at home or on the road.

When ordering, state kind of motor as chains are made different sizes.

Please send check or money order.

E. S. MICHENER
800 Washington St. New Castle, Pa.

75c. or 3 for \$2.00, postpaid

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**Dealers and Car Owners Everywhere have
Instantly and Emphatically Approved of the**

UNITED STATES TIRE COMPANY

The uniting of four of the most prominent tire makers in the country (Continental, G. & J., Hartford, and Morgan & Wright) into one huge selling organization—the United States Tire Company—has brought forth an expression of approval from both dealers and car owners that has never before been duplicated in the history of the automobile industry.

Every one, dealers and owners alike, have instantly appreciated the superior quality of tires which is bound to result from the combining of all the experience, all the manufacturing skill and all the secret processes of the world's four leading tire makers.

Dealers realize that the sales policy and the facilities of the new organization mean speedier and more satisfactory handling of orders than would ever be possible for a smaller organization.

They appreciate the immense advantages to the United States dealer in having the established demand for these famous brands focussed upon his store. This, coupled with the powerful backing up he will receive from our country-wide advertising campaign, will make United States Tires by long odds the easiest and fastest selling brand on the market.

But more than all this is the fact that they already know the new company thoroughly—know its fair and square policies and know every one of the men who will direct them.

Scarcely a dealer in the country but is personally acquainted with one or more of the men who will direct the selling policies of the UNITED STATES TIRE COMPANY.

J. M. GILBERT, GENERAL MANAGER (Formerly General Manager of the Continental Caoutchouc Company). J. D. ANDERSON, SALES MANAGER (Formerly President and Sales Manager of the Hartford Rubber Works Company). O. S. TWEEDY, EASTERN DISTRICT MANAGER (Formerly Sales Manager of the Continental Caoutchouc Company). A. I. PHILP, CENTRAL DISTRICT MANAGER (Formerly Vice-President and Sales Manager of Morgan & Wright). J. C. WESTON, WESTERN DISTRICT MANAGER (Formerly Secretary of Morgan & Wright).

These are the men with whom you will do business.

These are the men who guarantee TO YOU the fairest and squarest treatment it is possible for a concern to give its customers.

UNITED STATES TIRES AMERICA'S PREDOMINATE TIRES

Cost no more than other brands

UNITED STATES TIRE COMPANY
58th Street and Broadway, New York

MAKE YOUR CAR UP TO DATE NOW

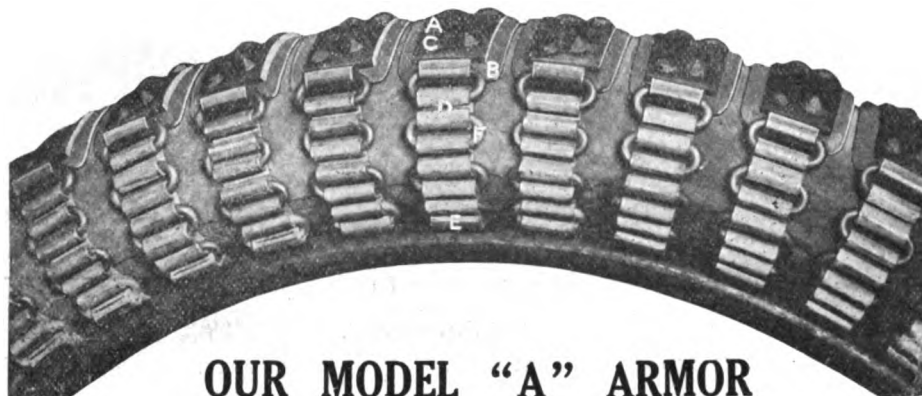
By Equipping
Your Tires with

DAVIS PNEUMATIC STEEL TIRE ARMOR

AND USING MID-WEST MOTOR SUPPLIES

STEEL

Puncture Proof
Blow-Out Proof
Rim-Cut Proof
Anti-Oxid
Resilient as a
Rubber Casing.



NO LEATHER

to WENT
to STIFFEN
to CRACK
or
to FALL OFF
Your TIRE.

OUR MODEL "A" ARMOR

IT IS AS NOISELESS AS ANY STEEL STUDDED TIRE. IN NO WAY AFFECTS THE INNERTUBE.
PRICE—ABOUT 60% OF CASING. WRITE FOR PRICES AND LITERATURE.

Also ask for Particulars about Our Davis Patent Motor Robes

Manufacturers
and
Dealers

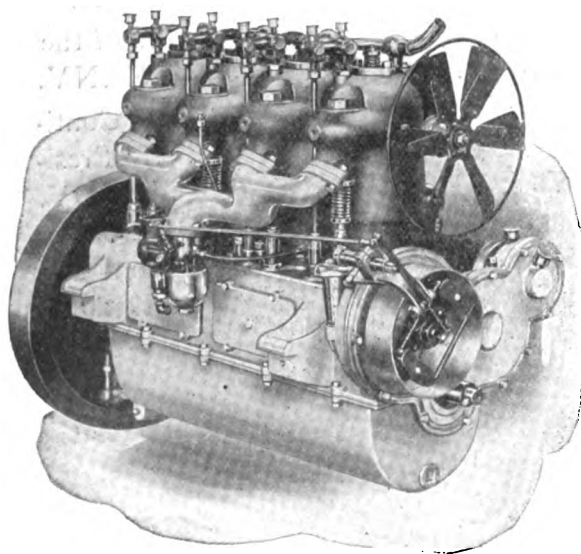
Absolutely no delay
in shipment

THE MID-WEST MOTOR SUPPLY COMPANY

Mid-West Building, 554 Jackson Blvd.
CHICAGO, ILL., U. S. A.

Send for Our
650 Page
Catalogue

"Everything for the
Motorist"



No. 11.—Single cylinder, stationary engines, 2 to 125 H. P.

Our 35 H. P. motor holds the world's speed record for one hour, for motors under 300 cubic inches displacement, made last November in Los Angeles in a Cutting Car.

Model Gas Engine Works

Lock Box, 2002.

PERU, IND.

WE have the most complete line in America. Write for the following catalogs of the line in which you are interested.

No. 18.—General construction of all motors from $3\frac{1}{2} \times 4\frac{1}{2}$ to 5×6 , cone clutches and transmissions.

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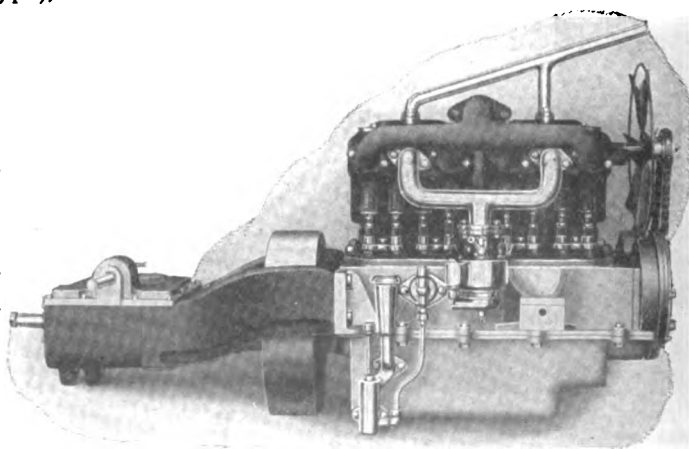
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No. 17.—4 cylinder, marine engines, 12 to 500 H. P.

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A.
S.
B.

TIRE PROTECTOR

*An Offer
to Car Owners*

If we have no agent in your city or town
handling the A. S. B. TIRE PROTECTOR
as a separate line, we will send you one

ABSOLUTELY FREE

*This offer is good only for
30 days from date of this issue.*

This offer is made in order to prove to you that the A. S. B. Tire Protector is the only mechanically **Perfect Tread** on the market; that it will give you longer service than the tire itself, and absolute freedom from puncture and blow-out—or other tire trouble.

The A. S. B. Tire Protector is the only tread that **always** runs evenly on the face of the tire.

The A. S. B. Tire Protector is guaranteed not to heat the casing or tube as the openings on the side give the air a chance to circulate and cool the tire. In fact a tire equipped with an A. S. B. Protector runs cooler than without one.

With your car equipped on all four wheels with the A. S. B. Tire Protector you can figure on from four to eight thousand miles without tire expense or trouble.

If you want our offer of one tread free, write at once for particulars.

Queen Manufacturing Co.

41 Seneca Street, WEBSTER CITY, Iowa

Five Years a Satisfied Splitdorf User

The voluntary words of a man who has used

Splitdorf Ignition

for five years and found it

Absolutely Perfect

MR. C. F. SPLITDORF New York.

NEW YORK, Dec. 19 1910.

Dear Sir:

Having used your ignition apparatus in three cars with unvarying success, I feel that it is only right to acquaint you with the complete satisfaction it has always given me.

My last car was equipped three years ago with a Splitdorf Magneto and Plugs, since which time I have driven over 68,000 miles and have never had the slightest ignition trouble. The plugs have never been out of the cylinders, not even for cleaning.

In view of this satisfactory service I cannot speak too highly of your ignition system.

Yours truly,

M. ROOSEVELT SCHUYLER.

Can you ask for better evidence of Efficiency and Reliability?

— Write for Magneto Catalog —

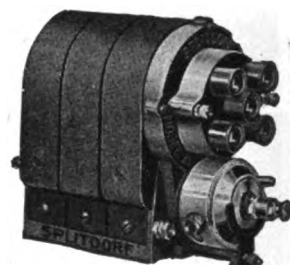
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San Francisco: 530 Van Ness Ave.
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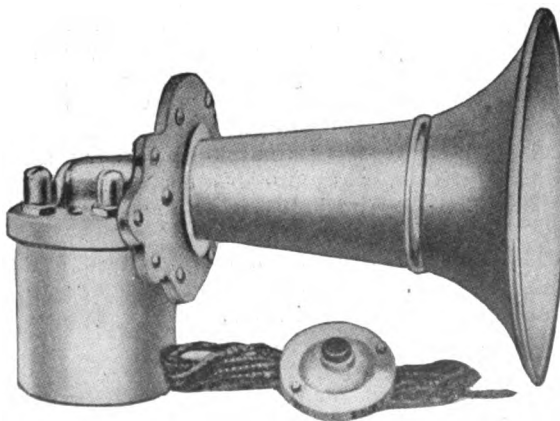


SPECIAL OFFER

You can make big sales and large profits selling

THE ARNOLD ALARM

FOR AUTOMOBILES



FOR MOTOR BOATS

The Perfect Electric Signal

The Arnold Alarm has a classy tone and appearance all its own. Is operated economically from six dry cells; consumes less than one ampere of current. Tone and volume may be adjusted very simply. Operated from push button attached to steering wheel. Sold under our broad guarantee.

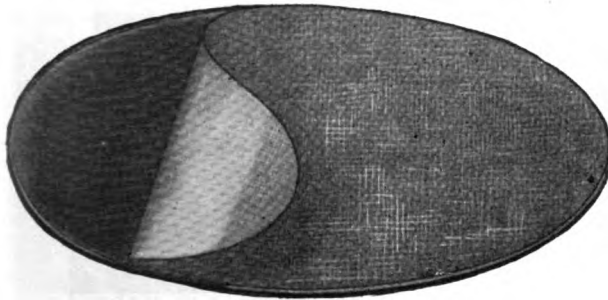
Its tone is always penetrating and attracts instant attention without startling.

Send for special offer at once.

STANDARD ELECTRIC WORKS, (Dept. S.) Racine, Wis.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Repair Inner Tubes With Ease and Speed



The Goodyear Self-Cure Repair Outfit offers the easiest, quickest and surest method of repairing inner tubes.

Simply clean the surface of the tube. Wash the raw gum surface of the Self-Cure Patch and stick it on. It sticks tight.

The heat generated by friction within the tire vulcanizes the raw gum to a certain extent. This tightens the grip of the Self-Cure Patch and ends the trouble with the tube. The back of the patch is cured rubber. After the patch has been applied, note how tightly it sticks. Note that it is almost impossible to tear it loose by use of the hands, without tearing the tube itself.

Every automobile owner realizes the absolute necessity for this Self-Cure Repair Outfit. There is a large demand for them.

Goodyear White Seal Inner Tube Patches

Another good, tight-sticking patch is the White Seal Inner Tube Patch. Friction, developing in the tire, cannot tear it loose. For its edges are so very thin that when cemented to the inner tube the patch and tube practically become a single piece of rubber. The patch is made of the same rubber as the famous Goodyear Red Seal Inner Tubes. This means that the **patch will stretch with the tube**. Most patches are made of cheap rubber and when the tube is inflated the patch tears loose because it will not stretch as much as the tube.



Goodyear Acid-Cure Repair Outfit

Permanent repairs by vulcanizing by the acid process is the mission of our Acid-Cure Repair Outfit. Quick, permanent repairs can easily be made. This outfit consists of $\frac{1}{4}$ -pint can of cement, a bottle of acid solution, emery paper and two brushes, all neatly packed in a convenient box.

Other Repair Outfits

Another convenient repair kit is our No. 2 Outfit. This is used for repairing punctured tubes. It contains six assorted tube patches, two tubes of patching cement, emery paper and valve insides. Valve caps, lock-nuts and washers are all neatly packed in tin box.

Our No. 5 Outfit is of equal efficiency and convenience.

Other Goodyear Accessories

Inside Tire Protectors, Rim-Cut Patches, Lever Handle Grips, Inner Tube Bags, Quick Repair Gum, Protection Patches, Sifter Top Talc Tubes and other motor car necessities.

Dealers, Repair Men, Garage Men find that because of the full satisfaction of Goodyear Accessories and our tremendous advertising, these articles are producers of bigger business than any other line of accessories. For trade prices write today to

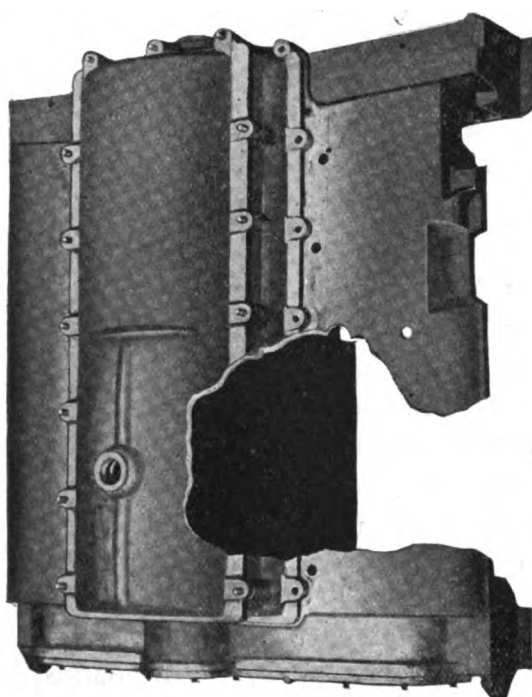


The Goodyear Tire & Rubber Co.
Sprague Street, Akron, Ohio

Branch Offices and Agencies in All the Principal Cities

Please mention the Automobile Dealer and Repairer when writing to advertisers.

We Do Welding—Right



Broken Crank-case Before Repairing.
A New One Would Cost \$310.00.

We weld cast-iron, aluminum, brass, copper, steel and sheet-metal successfully and guarantee our weld *Every Time*.

We make a specialty in welding cracked cylinders and water jackets, crank cases, gear cases, of cast-iron, malleable iron and aluminum.

Any broken part of automobiles, pumps or engines and other parts of machinery, whenever made of metal, we weld to last as long and to be as strong as a new part, thereby saving the public from 50-75% whatever a new part would cost.

Our facilities are such that we can take care of any quantity of work which may reach us, to have it returned to our customers at least inside of two or three days.

Quite often the customer can wait for and see how it is done.

We make no secret of our process and let the customer see it if he wants to.

Estimates given after we see the broken parts, in fact, we like to tell the customers what it will cost before doing it, thereby giving more satisfaction for both sides.

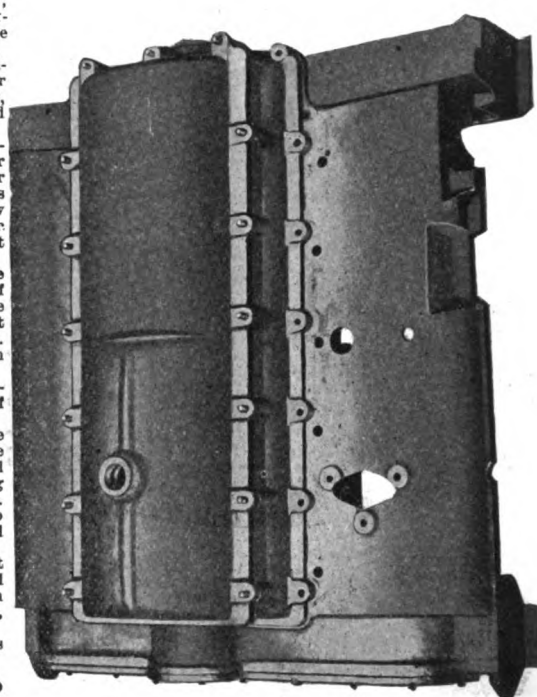
Nothing too small nor too large of what we could or would not be able to take care of.

Our works are so located that they can be reached by water, rail and roads. Automobiles can drive in our yards and leave cars, till repairs are done.

Quite often, we do the repairs without dismantling the cars.

TRY US AND BE CONVINCED

Write for estimates and interesting printed matter.



The Same Crank-case After Being Repaired
at a Cost of \$19.00.

The Superior Welding Co., 680 Canal Street, Stamford, Connecticut
Connected by Telephone **M. J. FUCHS, Prop.**

75 Per. Cent. of the GASOLINE Used in 1910 Was Poured Through

DOVER AUTOMOBILE FUNNELS

56 Styles and Sizes of Funnels for Automobile, Motor Cycle and Motor Boat Use.

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Dover Stamping & Mfg. Co., Cambridge, Mass.

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SPECIAL NOTICE

CONCERNING

K & W PATENT RELINERS

To Consumers, Dealers, Jobbers and Tire Repair People.



Reg. Applied For.
Above shows K & W Reliners strengthen tires so much that they may be worn entirely through without having blow-outs.

The K & W Patent Reliner

was "the first successful reliner" ever manufactured, and is, and always has been, made of a better quality of material than any imitation or infringement.

Remember, The K & W Patent Reliner is Fully Guaranteed.

TIRE REPAIR PEOPLE everywhere are using K & W Patent Reliners in their repair work, which proves they are a good thing to strengthen weak tires.

We guarantee K & W Patent Reliners to eliminate your tire trouble and tire expense and agree to refund money if reliners are not satisfactory in every way.

You might be surprised to know that there are nearly 15,000 K & W Patent Reliners in successful use at the present time.

Eventually, K & W Patent Reliners will be used by all auto owners as a means of preventing tire trouble and reducing tire expense.

**Be sure you get a K & W
=====IT'S BEST.=====**

For sale by nearly all dealers, jobbers and tire repair companies. If your dealer does not have them, write us **AT ONCE** for our Proposition on a Trial Order.

K & W MFG. CO., 3rd St., Ashland, Ohio.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

As manufacturers of K & W Patent Reliners, which are sometimes called Inner-Shoes, Inside Tire Protectors, Inner-Tires or Tire Reinforcements, we are pleased to advise you that we own, **EXCLUSIVELY**, patents which are basic and which cover the reliner thoroughly. What the **SELDEN PATENT** is to the gasoline automobile—our patents are to the successful inside tire protectors.

No doubt you are aware that there are several imitations and infringements on the market, the manufacturers of which claim to have "something just as good." Our reliners are semi-cured; a feature which is covered by patents. Under-cured reliners tend to become cured by the heat generated by the friction of the tire on the road, while full cured reliners would become over-cured and deteriorate rapidly. This is why **semi-cured** reliners remain soft and pliable and are of long life.

The K & W Patent Reliner is coated with a vulcanizing compound which causes it to adhere firmly to inner walls of tire. Thus, it will not creep or generate heat by its use. This feature is **also** patented. Patents "also" cover coating inside of tire with a vulcanizing compound before applying Reliner.

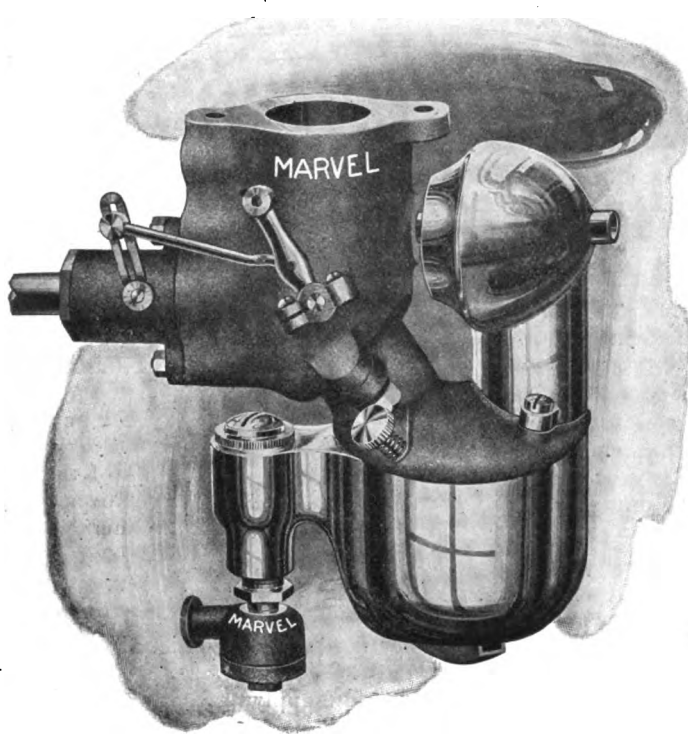
Therefore, when anyone offers you a semi-cured or cement coated reliner by whatever name called, they are imitators or infringers unless the following dates of patents are stamped on inside of reliner:—"Dec. 28th, 1909, and Jan. 4th, 1910." Evidence is being secured against infringers and prosecutions will follow.

Why should you purchase these imitations and infringements when you can purchase the original "patented" reliner at no greater cost?



Reg. Applied For.
These Tires can be seen at our Office.

It Hits Every Time and Fits Any Car.



Why go out the back door to reach the front porch?
Why shift to low gear for slow speed if it can be had on high?

You can drive at $2\frac{1}{2}$ miles per hour on high gear with the Marvel.

You can handle any of the so-called gasoline too and save enough fuel to buy the Marvel this season.

Guaranteed or money back.

Special models for *your* car. Give us the name and we will mail you a post card showing the model and the price, ready to slip on.

MARVEL CARBURETER COMPANY

2225 Alvord St., Indianapolis, Indiana.



In offering "REX" METAL CREAM to dealers we present a metal polish of unusual quality—one that not only cleans and polishes brass, nickel, steel, etc., but also brings out or renews the original lustre of the metal itself.

When you hand a can of "REX" over your counter you may be assured that you will have made a friend and a customer. "REX" covers a wonderfully large surface—that spells economy. It can be rubbed and polished while moist—that's a saving of time. Automobile owners are using "REX"—they say it's the only metal polish for motorists.

Let us send you samples, then test it yourself—we feel sure that "REX" will find a place in your day's sales "right away." Guarantee "REX" fully—we will stand back of every proper claim you make.

ARMIGER CHEMICAL CO.
2150 AUSTIN AVENUE, CHICAGO, ILL.

Tires Guaranteed For 10,000 Miles



We guarantee tires of standard make to run ten thousand miles if equipped with Inner Casings when new. A certificate of guarantee goes with each purchase.

We have positive proof of tires having run over 20,000 miles, and without a blowout. Most users get over 15,000 miles from new tires with Inner Casings, and used tires last proportionately long.

Inner Casings are also guaranteed to positively prevent all blowouts and punctures. They lace around the tube, relieving the outer casing of strain. Do not confuse them with reliners and protectors which merely lie loosely between tube and outer casing. No other tire protector sold will reduce the tire cost per mile. No other manufacturer will back up their claims with a signed guarantee.

Inner Casings cost less than tubes and the saving in vulcanizing alone will pay for them.

We have an excellent proposition for vulcanizing concerns, and some valuable territory open for agents. Exclusive right.

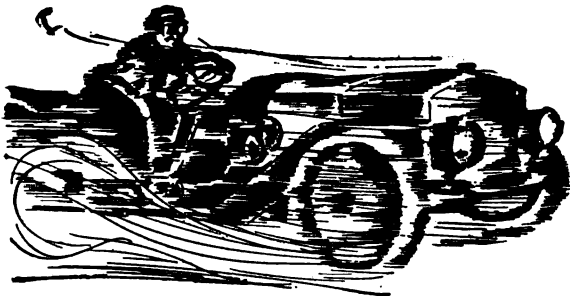
Write for full information today.

WESTERN AUTOMOBILE SUPPLY CO.,

6221 WAYNE AVENUE,

CHICAGO, ILL.

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No Matter How Fast— You Can Stop Almost Instantly—

Half the pleasure of automobiling is lost when there is any doubt about the brakes being able to bring car to a quick stop in case of emergency. Imminent danger often looms up only a few feet ahead and it is next to impossible to avoid serious accident if brakes are equipped with ordinary linings, for tests show that most linings will not lock wheels of a car in less than 12 to 25 feet. Wheels can be locked almost instantly with

J-M NON-BURN BRAKE LINING

This mineral lining, when applied to the metal drum, grips like a pipe wrench and the wheels cannot budge. Yet, a car can be stopped just as slowly and just as gently with J-M NON-BURN LINING as with any other lining.

Intense heat created by friction, and oil, gasoline and water, which soon put an end to organic linings, have no effect whatever on this Asbestos lining.

If your dealer will not supply you with J-M NON-BURN, write us and we will tell you where it can be obtained, or sell you direct.

Write our nearest branch for sample of NON-BURN and a copy of "Practical Pointers on the Care of Automobile Brakes."

H. W. JOHNS-MANVILLE CO.

Manufacturers of Asbestos
and Magnesia Products

ASBESTOS

Asbestos Roofings, Packings,
Electrical Supplies, Etc. . .

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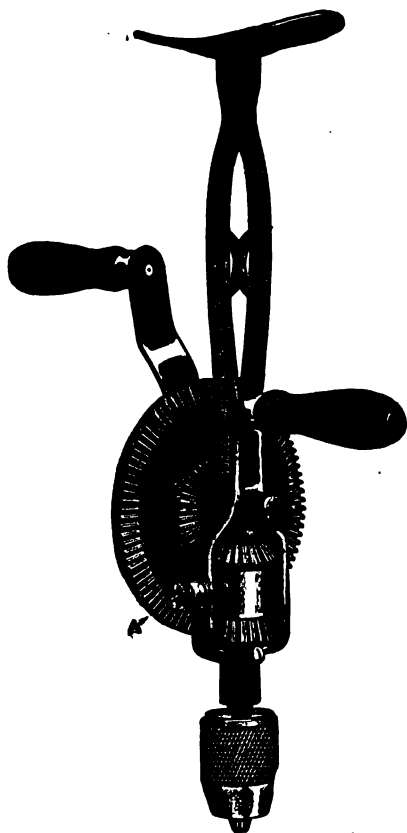
Milwaukee
Minneapolis

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(1186)



BREAST DRILLS

No repair outfit is complete without some tool of this description, and those who are wise use GOODELL-PRATT'S.

These Drills have CUT GEARS, strong STEEL CHUCKS, and are accurately machined and carefully assembled.

We offer 15 different styles.

Goodell-Pratt Company

Toolsmiths

GREENFIELD, MASS., U. S. A.

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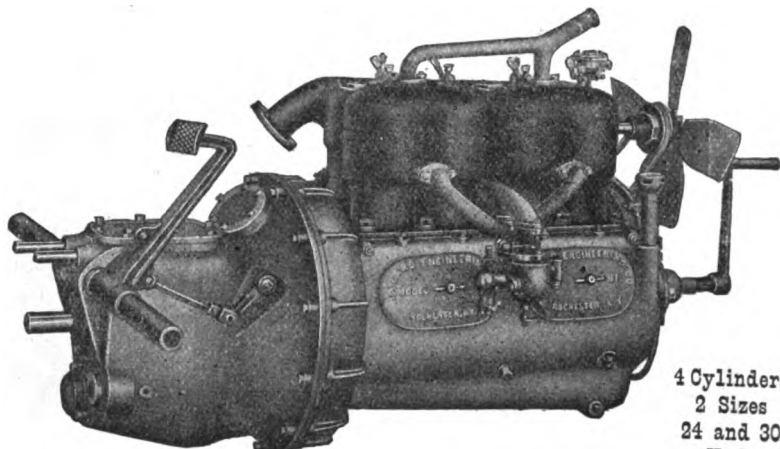
REPLACE THAT WORN OUT MOTOR IN YOUR CAR WITH A HAZARD UNIT POWER PLANT

The THREE Point Suspension Makes it Easy to Install in Practically Any Chassis at Small Cost.

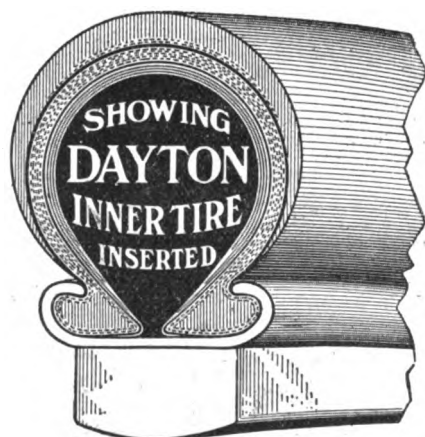
OIL TIGHT, DIRT PROOF,
POWERFUL, RELIABLE.

Write For Prices.

HAZARD MOTOR MFG. CO., Scherer Street, Rochester, N. Y.



4 Cylinders
2 Sizes
24 and 30
H. P.



Tire Troubles Stopped

Wear the treads completely off your tires without puncture, blow-out or rimcut by inserting the

DAYTON INNER TIRE

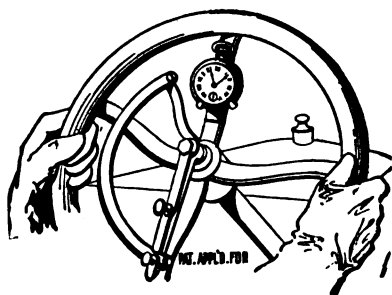
Inexpensive

Inserted and removed and placed in other tires by anyone.
Write for a descriptive price list to-day.

DAYTON INNER TIRE & MFG. CO., 19 Madison St., Dayton, Ohio

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Better Than a Clock.



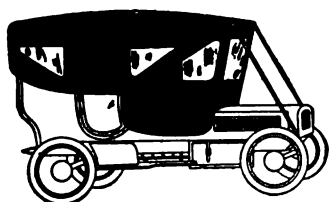
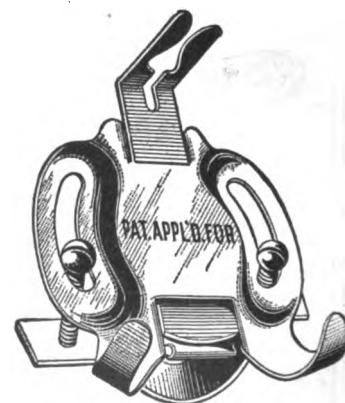
Any watch will fit this Attachment.
Places the time where you can see it.
Watch can be inserted or removed instantly.

Nicely finished and Nickel Plated,
Post Paid, \$1.00.

If your dealer cannot supply you, we will send post paid on receipt of price.

THE STERLING MFG. CO., Inc.,

SUCCESSORS TO
H. L. LANG, STAUNTON, VA.



AUTO TOPS, \$25.00

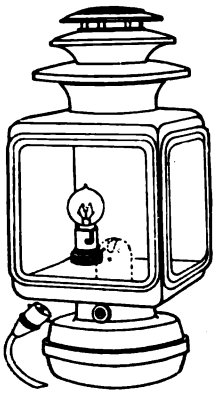
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BUOB & SCHEU,

Wind Shields and Dust Covers.

No. 1000 Broadway, Cincinnati, Ohio.

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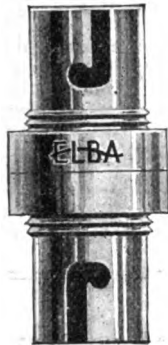
Electric fitting installed in a square side lamp.

Lamps cannot work loose in this socket because they are *locked* in place by plungers, controlled by strong springs.

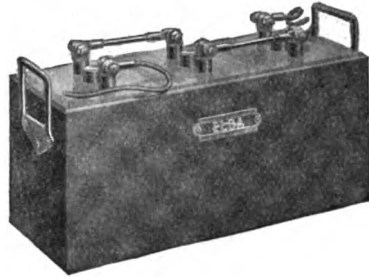
NO man would be without the convenience and cleanliness of electric lights in side and tail lights if he knew how easily the fittings are put into the lamps, how inexpensive the material is and how satisfactory when in service.

The ELBA fitting does not interfere with the lamp being used as an oil lamp, thus providing two entirely separate and independent methods of lighting.

A special ELBA Lighting Battery is furnished for this service.



TYPE U
Actual Size

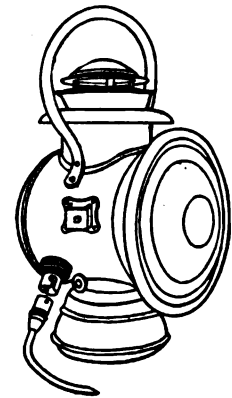


LIGHTING BATTERY

Ask Dept. A for Bulletins No. 24 and No. 27.



TYPE V
Actual Size



Electric fitting installed in a lantern type side lamp.

Type "U" in side and tail lights can be adjusted to any desired height. Type "V" attachment plug completes the fitting.

Specify the ELBA Electric Lighting System on your new car.

The Willard Storage Battery Co., Cleveland, Ohio

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The Incomparable 400 Blower, the one great Heirloom that will be handed down from one Generation to the other. Ask What the Owners Say.

The 400 Steel Blower will serve the youngest mechanic faithfully without expense for a long lifetime.



Crank turns either way.

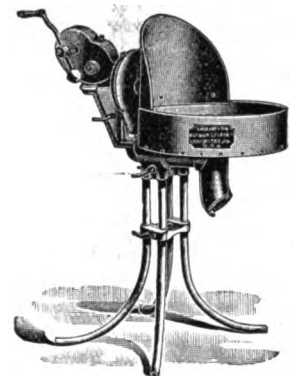
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The No. 400 Champion "Whirlwind" Blast Anti-Clinker, Heavy Nest Tuyere Iron is furnished with all 400 Blowers WITHOUT EXTRA COST.



No. 400 Steel Blacksmith's Forge.



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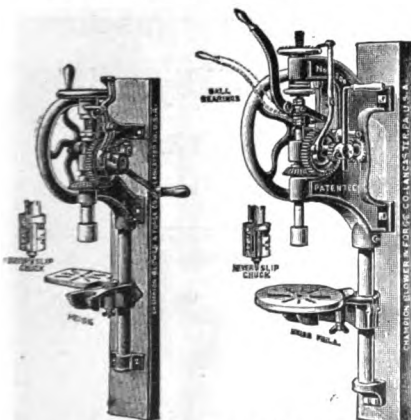
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Made With Ball Bearings only

With the LEVER- or AUTOMATIC SELF-FEED 95 per cent in Time and Labor is Saved by the INSTANTANEOUS RAISING of the Drill Bit out of the hole just bored and again replacing the drill bit back on the material ready to bore the next hole.

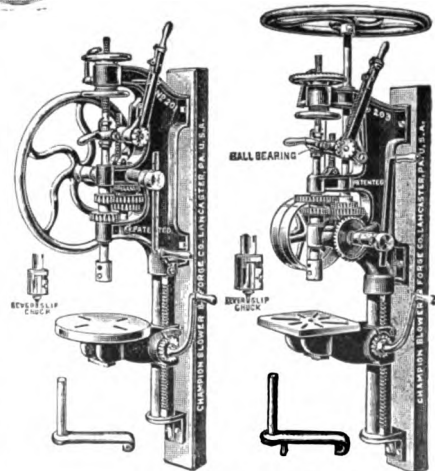
Remember—There is no TURNING BACK of the FEED SCREW NUT WITH EITHER FEED.

Before purchasing a Hand Blower, Forge, Drill Press, Tire Shrinker, Screw Plate, Power Blower, or Electric Blower, write for our free catalogue, which always shows the greatest variety of improved Blacksmith tools built under one control in the world.



No. 90 Drill.

No. 200 Lever-Feed Drill.



No. 201 Self-Feed and Double Compound Lever-Feed Drill.

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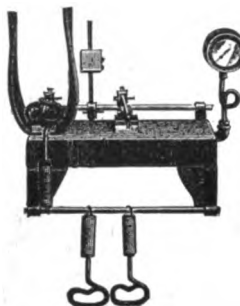
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Std. 3 Cavity Vulcanizer.



Tube Vulcanizer.

TIRE REPAIRING is a paying addition to garage or repair business, also a profitable independent business, requiring little capital. But to make durable and neat repairs—the kind that build business—your equipment must be right.

AKRON-WILLIAMS TIRE REPAIR EQUIPMENT was designed by practical repairmen from the tire factories. It is all finely machined.

Localized heat is the secret of good repair vulcanizing. Three separate steam chambers in each of our sections apply the heat to the repaired part only. This prevents overcuring the rest of the tire. The feature is patented and used in these vulcanizers exclusively.

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Pot Heaters and Steel Vulcanizers
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Will "Cut-Out"
Your Troubles.

Can't be
Shaken Off.

GET IT NOW.

tests safe. No glass to break. Greater pulling power. Smoother running.

What Do You Pay an Expert To-Find-Troubles?

On a \$3 investment, Many Are Saving \$25, \$50, \$100. SO MAY YOU.

THE "MEANS" CYLINDER CUT-OUT SWITCH

Shows whether trouble lies in electrical current, plugs, valves, or faulty mixture. Will cut-out any number of Cylinders, and you have—both hands—free. Nothing to hold. The Fibre Block and Arm preclude possible shocks. Keep motor running. Keep terminals attached. All

ORDER—To-day and Save—REPAIR BILLS.

From your dealer, or sent postpaid on receipt of price.

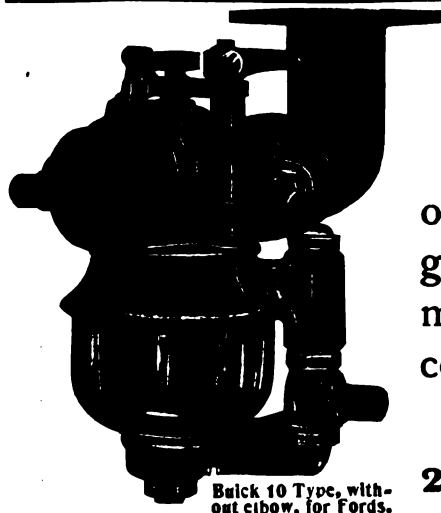
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Special Heitger Carbureters for Small Cars

Made of Aluminum, nickel plated, heavy glass or metal float bowls, separate adjustments for gasoline, on high and low speeds, giving maximum speeds, fine control, minimum gasoline consumption. Special types for Motorcycles also.

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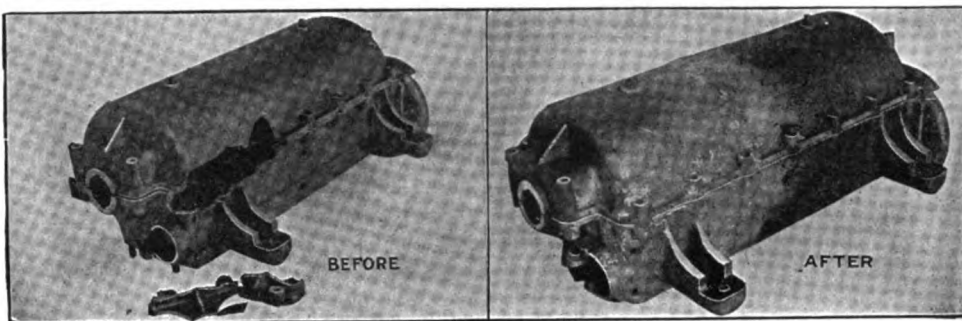
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OUR WORK IS GUARANTEED.

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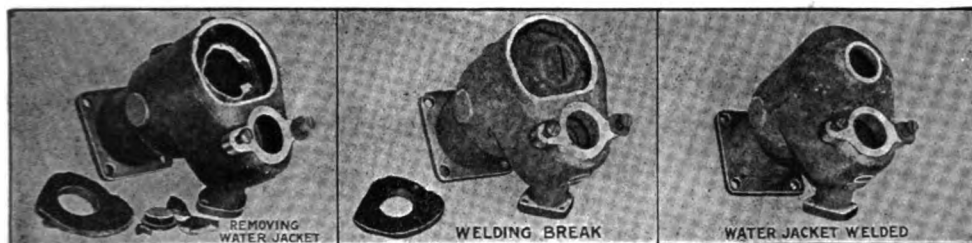
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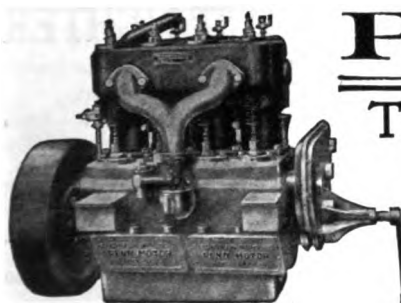
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THIS construction enables us to build the lightest, most compact and durable motor on the market.

Large Valve Areas and short lifts add to the power as well as the quiet running.
Crank-shafts of the suspended type.

Motors are equipped with a self-contained oiling system, and all parts are interchangeable and accessible.

Large Water Jackets, circulation being complete around cylinders, and valve chambers of sufficient area to make possible to run either by forced circulation or Thermo Syphon.

TWO TYPES } 20-24 H. P., 4-cyl., 3½-in. bore, 4½-in. stroke.
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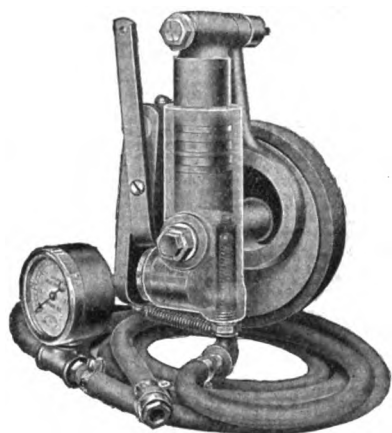
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Manufactured by **CHESTER ENGINEERING & MACHINE COMPANY, Chester, Pa.**

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WEAR LONGEST

EMPIRE TIRE CO., Trenton, N.J.



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The Only Automatic Tire Pump

The Ten Eyck Pump is simple—compact—powerful—"fool proof" and easily installed on any car. It will quickly save its cost by reducing tire expense, and it is entirely automatic.

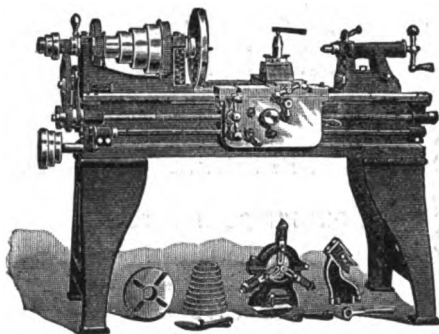
Attaching the hose to the tire valve starts the pump instantly. The motor does the work. Disconnect the hose at the gauge pressure wanted and the pump stops.

All metal, with ground bearings and cylinders.

We want responsible agents.

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9 in., 11 in., 13 in. SWING.

Suitable for fine accurate work in the garage, repair shop, tool-room and machine shop.

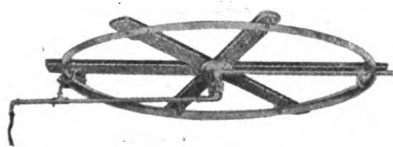
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A-1

A "Perfect" Vehicle Washer



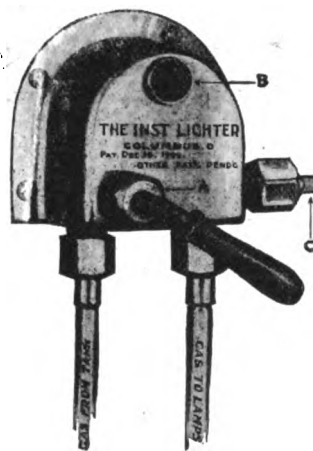
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lights and controls the gas head-lights from the driver's seat.

Can be mounted on the dash or on the heel-board.

THE ONLY SUCCESSFUL LIGHTER ON THE MARKET.

The spark is under absolute control of the operator.

NEW MODEL, with new indestructible burner clips, improved coil, tubing, wire, etc., \$15.00.

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TO OPERATE:—Turn handle "A" and push "B"

DOES YOUR RADIATOR LEAK?

If so fix it yourself by dumping in a box of

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To apply—take off cap and strainer, pour in SE-MENT-OL. Run engine 10 minutes, drain out excess, fill with clear water.

75 Cents per Box.

Ask your dealer or write direct.

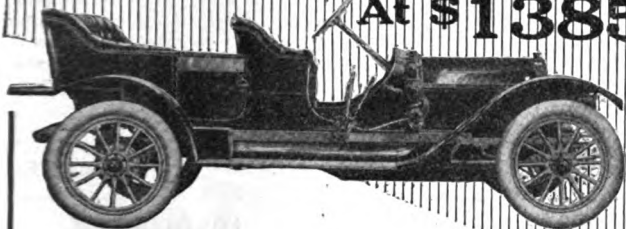
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**Big = Powerful = Striking
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At \$1385**



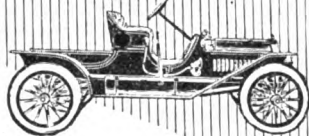
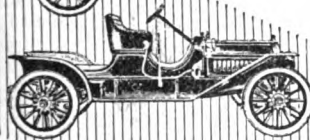
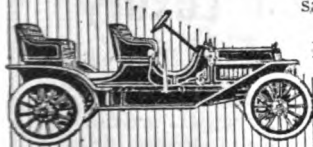
**40 Horse Power
120 Inch Wheel Base
5 or 7 Passengers**

These three points alone at \$1385 put the Schacht in a class by itself—take it out of competition—make it the easiest car to sell in the entire automobile field.

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For four years our 3 in 1 cars have been the most satisfactory and popular low priced cars on the market. Their easy convertibility from runabout to touring car or delivery wagon gives them a unique advantage over any other car in their class. They offer you the best chance to cover this wide and profitable field.

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**Every
Manu-
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Says--**

**"My Product
is the Best"**



But—after all is said—it's the test that tells.

When we say "Keystone Grease is far superior to any other lubricant made," we do not ask you to accept our unsupported statement.

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Wm. Cramp & Sons Co., the greatest ship building company in the world—recently proved by actual test with the Cornell Oil Testing Machine, that Keystone Grease is fourteen times as good as some lubricants, 75 times as good as some others.

Keystone Grease maintained the same consistency under bearing pressures ranging from 2,000 to 5,000 pounds—the latter the maximum capacity of the Cornell Oil Testing Machine.

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Keystone Motor Oil

Keystone Motor Oil is a cylinder oil of the same high standard as Keystone Grease. It holds its body, maintains a perfect oil film, and burns up clean.

Keystone Motor Oil is the only lubricant that will not deposit carbon under any cylinder heat, and that will not decompose or lose its necessary viscosity in any working condition.

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Send for interesting lubricating literature—a liberal education on the subject.

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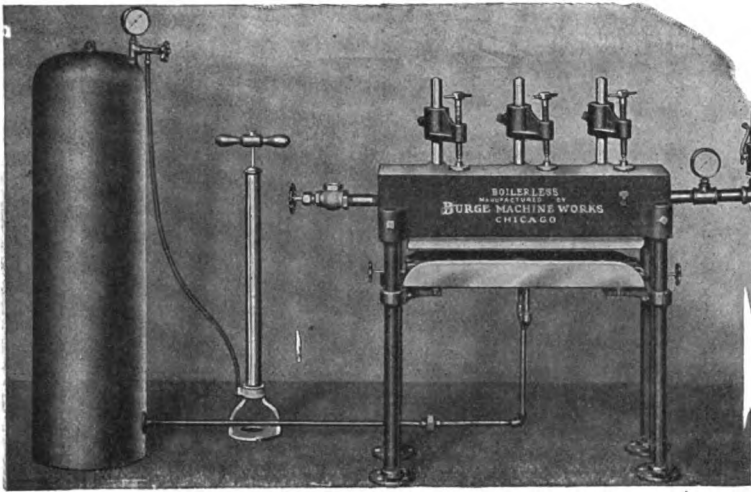
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A **STEAM** Vulcanizer operated by **Gasoline**. The **Excelsior** makes its own steam, no boiler required.

Nothing but **gasoline** needed to produce the most perfect work on inner tubes. Equipped complete with gasoline tank, pump, steam gauge, pop valve, filling valve, drain cock, oil connections and our famous quick acting clamps ready for use.

If **gas** is more convenient than gasoline, we furnish the outfit arranged accordingly.

The **Excelsior** line of vulcanizing machinery is known from **New York** to **California**, and from **Minnesota** to **Texas**; anyone who has ever used an **Excelsior Steel Retreading Kettle** or **Inner Tube Machine** knows that they turn out the very finest work and in the shortest time, with the least amount of labor. Complete tire repair plants including boiler, kettle, air compressor, buffing stand, air receiver, motor, etc., etc. Write to-day for descriptive bulletins of the vulcanizing outfit that the tire manufacturers use themselves and recommend.

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The average Shock Absorber is adjusted for bad roads only—when riding over good roads your car then rides like a lumber box—your springs are stiffened. **Westen Shock Absorbers** automatically adjust themselves for any road condition—your car rides the same always.

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**VANGUARD
BALL
BEARING
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**ABSOLUTELY
AUTOMATIC**

Any position desired can be obtained without stopping car. This shield operates with more ease than any other, as it operates on

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Send for discounts.

Zig-Zag, - List, \$30.00

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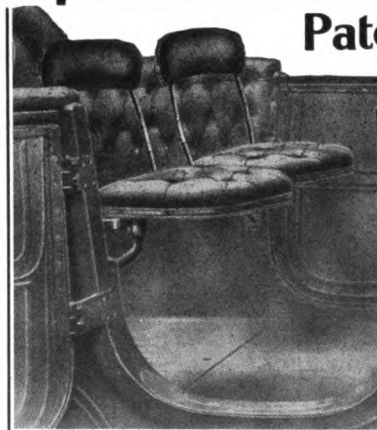
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Made from steel drop forgings; artistic in design and finish; compact, rugged and durable.

A necessity of high grade car equipment.

Write for catalog showing various models.

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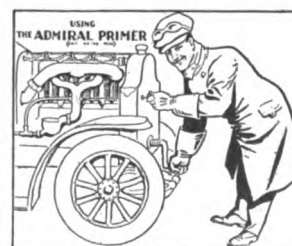
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By attaching to your pump a safety tire gauge. Pump your tires to the prescribed pressure and double the life of your tire. Worth \$100 to any motorist. Sold for \$1.50.

All dealers or by mail on receipt of price and 6c postage.

SAFETY TIRE GAUGE CO.
1468 Michigan Avenue Chicago

PRICE \$1.50



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(Patent Applied For.)

INSTANTANEOUS ENGINE STARTER

A PULL OF THE BUTTON AND ONE TURN OF THE CRANK DOES IT ALLWAYS, NO MATTER WHAT THE WEATHER.

DO YOU EVER

Have trouble starting your motor? Have to crank until you are "Black in the Face?"

Have to remove the spark plugs and pour gasoline into the cylinders?

THE ADMIRAL PRIMER does away with all this; puts pure gasoline into the cylinders with one pull of the button; YOU can attach it to YOUR car in thirty minutes, AND YOU WON'T HAVE TO CARRY YOUR RELIGION IN YOUR WIFE'S NAME IF YOU USE IT.

SHOULD BE ON EVERY CAR.

EVERY DEALER AND REPAIR MAN

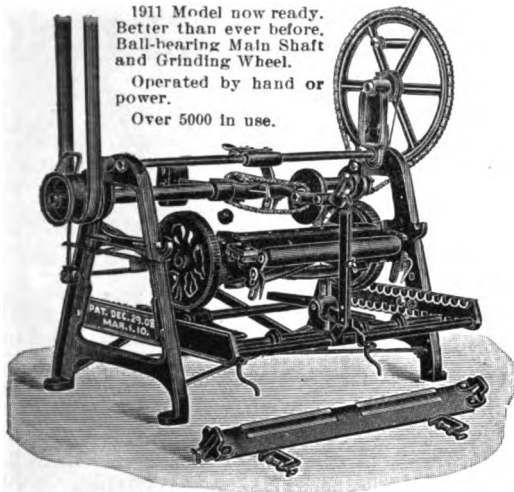
SHOULD CARRY IT IN STOCK.

Price \$3.50, Prepaid.

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"You Grind It as You Find It"



SEND TO-DAY for full description of this wonderful labor-saver and money-maker. Nothing like it on the market. Grinds all makes of Mowers perfectly in 15 minutes without removing reel-knife. New Skate Sharpener Attachment for Grinding Skates. Will more than pay its cost the first season, because it does the work so much quicker and better. Used by U. S. Government and City Parks. DO IT NOW. Address,

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Get Our Special Offer
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"SAMSON"
Electric Horn



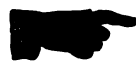
STRONG - LOUD - SIMPLE - RELIABLE

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CHICAGO, ILL.



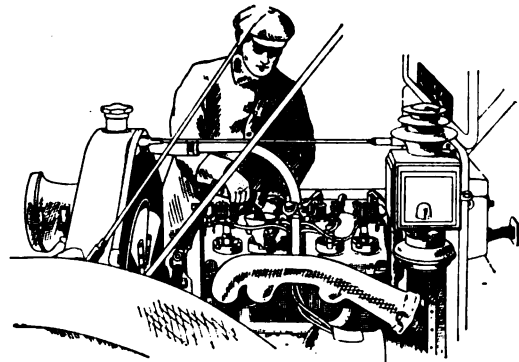
EVERY

**DEALER,
REPAIRMAN
AND
GARAGE**

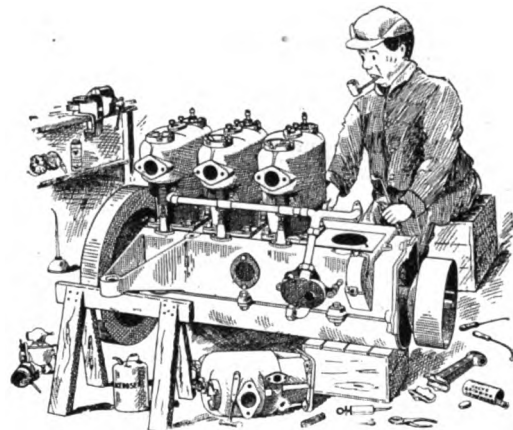
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The Dry Cleaning Cylinder Compound



THE NEW WAY.



THE OLD WAY.

FLASH DECARBONIZER is poured from the can through the spark plug hole into the combustion chamber. The heat of compression vaporizes it and it is blown through the exhaust in a fine dust-like state.

The first illustration shows the method of application.

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It is a significant tribute to the quality of HESS-BRIGHT BALL BEARINGS that their dimensions have been taken as standard for nearly all makes of bearings.

For that reason HESS-BRIGHT BALL BEARINGS may be used to replace not only other Hess-Bright Ball Bearings, but other makes also, wherever greater endurance and lower cost of up-keep are desired.

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The more frequently used bearing sizes are also carried in stock by

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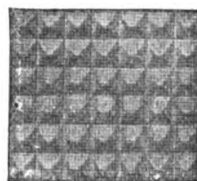
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CHANSOR & LYON MOTOR SUPPLY CO.,

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For Automobile Running Boards, Floor Boards, Motor Boat Floors, and for any place where matting is exposed to severe wear.

Aluminum Matting is very easily applied.

It will not rust, tarnish nor stain from the effects of oil, grease or gasoline.

It can always be restored to its original brightness when washing the car.

Yet it costs less than good rubber and will last much longer.

Stock sizes are 9, 10, 12, 14, 15, 18 and 20-inch widths, in rolls of about 50 lineal feet, and 24 and 30-inch widths in 24-foot rolls.

Also in sheets 36 inches wide by 84 inches long.

Other special sizes can be supplied to order when the quantity is sufficient to warrant.

Samples of matting and further information will be sent upon request.

Metallic Automobile Matting Co.,

295 MILL ST., ROCHESTER, N. Y.

Dealers and Repair Shops!!

NOW IS THE TIME TO ORDER



While the cars are laid up for repairs.

**VELVET AUXILIARY
SPRINGS**

Ride "SOFT AS A VELVET CUSHION."

They will fit any $\frac{3}{4}$ -elliptic, platform, or full-elliptic spring with scroll end.

Prospective buyers of cars: Ask the manufacturer to equip your car with "Velvet Springs."

If you sell one customer, you can sell nearly all. **VELVET SPRINGS** will help sell the car for which you are agent.

You can attach in twenty minutes. No machine work is necessary. Adjustable for different loads. All side sway is eliminated. Will not throw over. Performs all functions of spring links.

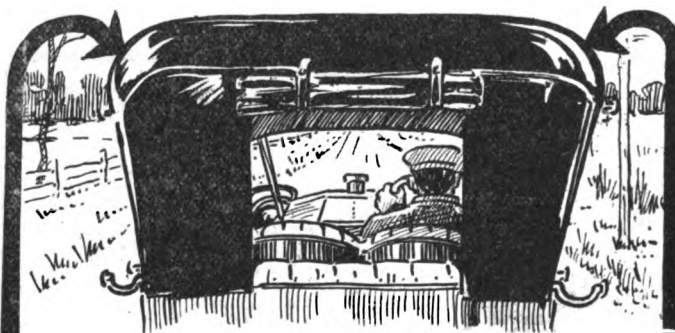
PATENTS PENDING. WRITE FOR CATALOG AND PRICES.

New York Agent: E. J. Edmond Co., 1783 Broadway.

San Francisco Agent: J. F. Revalk, 518 Van Ness Ave.

New England Distributor: W. J. Connell, 555 Boylston St., Boston, Mass.

JOHN W. BLACKLEDGE MFG. CO.,
1502 Michigan Avenue, CHICAGO, ILL.



There's Only One Way to Treat a Top. Give it a Coating of the Famous

FELTON-SIBLEY'S Auto-Top Dressing

It will make it look like new. Being weatherproof, a coat of this dressing will add wonderfully to the life of the top. Easily and quickly applied with a brush, it dries quickly and won't injure the most expensive top.

Comes in many standard colors—special shades to order. Send today for sample color card and prices. Excellent for carriage tops, too. In $\frac{1}{4}$ -pint cans and larger.

If the top has never been painted, we recommend strongly our "F-S" Auto-Top Sizing.

Remember, that back of every can is nearly half a century's paint and varnish experience.

FELTON, SIBLEY & CO., Inc.

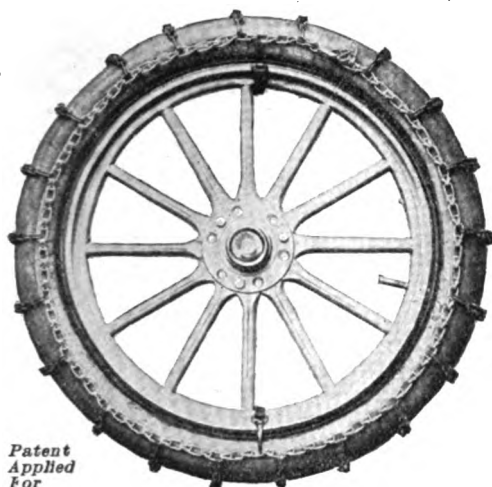
Manufacturers of Colors, Paints and Varnishes

136-140 N. 4th St.

Philadelphia, Pa.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

"The Chain That Lasts"



Patent Applied For

The
BEST
Traction
Chains

We claim that we furnish the
Best Cross Chains
used in tire chains.

Write us and we will tell you why.

We have an Adjuster that will fit any size chain.

H. E. McLAIN & CO.
91 North Avenue Natick, Mass.

PACIFIC COAST AGENT,
JOHN F. REVALK, 518 Van Ness Ave., San Francisco, Cal.

THE GENUINE MAHER DUPLEX MULTI Only Genuine Self Cleaning Spark Plug on the Market

IN THIS SPARK PLUG is embodied a double annular spark gap, one working auxiliary to the other. The sparks ordinarily cross the upper spark gap; thus, should the sparks fail to cross the upper gap for any reason, the lower flange provides an auxiliary spark gap, insuring the proper sparking and ignition of the gas to obtain the best results. The lower flange or electrode closes the end of the firing chamber in such a manner that it also acts as a baffle to keep the oil from entering.

The enclosed firing chamber in which gas, accumulated under pressure during the compression stroke and being fired up in the cavity, is shot forcibly out into the cylinder upon ignition, carrying with it all soot and foreign matter, causing the spark gaps to be automatically cleaned and also causing a complete combustion of each charge. Porcelain cannot break thru heat or expansion as it is shielded from direct contact of the hot and cool gases of the explosion and compression strokes. Price \$1.25.

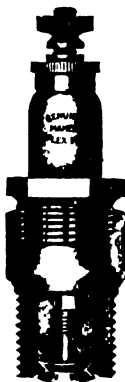
N. B.—"This ad. is worth \$0.50 per plug up to six plugs, when sent in accompanied by 75 cents for each plug ordered." (List price, \$1.25.)

Write for Dealers' Discounts

THE DUPLEX MULTI-SPARK PLUG CO., Devil's Lake, North Dakota



PAT. JULY 19, 1910



Pat. July 19, 1910



REX SPARK PLUG

KING OF PLUGS.
FOR MAGNETO
OR BATTERY.

Simple Construction.
Hot Spark Absolute.
No Short Circuit.
Sootproof.
Highest Grade.
Hardfire Porcelain—
Specially Designed.
Guaranteed to with-
stand the Heat.
Electrode, Meteor
Wire, which cannot
burn out.

Packing, Copper Asbestos Gasket. All
Sizes.

Metric, Half-inch, A.L.A.M. and Motor-
cycle.

SATISFACTION GUARANTEED.
Interchangeable Porcelain.
REGULAR PRICE, \$1.00

REX IGNITION MFG. CO.,

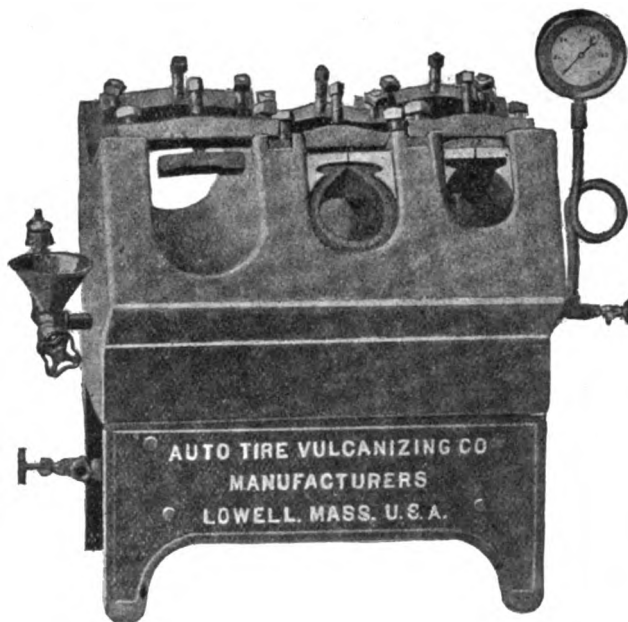
1779 BROADWAY,

NEW YORK.

SAVING MONEY
Enclosed find \$2.00 for
Spark Plugs. Size Thread.....
Name.....
Address.....
Name of Car.....

**SPECIAL
INTRODUCTORY
OFFER TO
READERS OF
THIS
MAGAZINE.**
We will send
set of
four plugs for
\$2.00—just
half price—to
any reader
who will cut out
above corner
coupon and
send in with
cash.
Be sure to give
size of thread
and name of
car.

Our New No. 8 Adjustable Sectional Vulcanizer With Three Cavities



As a Progressive Business Man you should by all means use,
handle or recommend our

New Improved Auto-Tire VULCANIZING MACHINE

simply and solely because it is the best there is in Vulcanizers at any price and because the price isn't much, the operation is easy and profits are exceptionally large.

Our machine is different, far better and more economical in operation and investment cost than any other made. In all features it is so superior to all other devices there is hardly a comparison. We have some facts that will interest you and that will put you in the way of big profits. In your own interest, get posted—Write to us to-day.

Auto-Tire Vulcanizing Co., Lowell, Mass.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



"Ideal" Inner Sleeve

To remedy a "blow-out," or if applied to a weak spot will keep an old shoe in service.

PRICE LIST

3 in.,	\$1.00	3 1/2 in.,	\$1.25
4 "	1.50	4 1/2 "	1.75
5 "	2.00		



"Ideal Twin" Sleeve

Designed to permanently as well as temporarily provide against "Blow-outs" or rim-cuts. An inner sleeve and an outer jacket with wearing surface combined.

PRICE LIST

3 in.,	\$3.00	3 1/2 in.,	\$3.75
4 "	4.50	4 1/2 "	5.00
5 "	5.50		

Standardized and Reliable

For sale by principal dealers. If your dealer does not handle them, write direct to us.

Full Line Auto Tire Repairers' Stocks, Frictions, Tread Stock, Patching Gum, Cement Sheet, etc.

WRITE FOR SAMPLES AND PARTICULARS

VOORHEES RUBBER MFG. CO.,

18 to 46 BOSTWICK AVE., JERSEY CITY, N. J.

38 VESEY ST.,
NEW YORK.

34 COLUMBUS AVE.,
BOSTON.

87 WASHINGTON ST.,
CHICAGO.

Where an Ounc
of

KNEAD-IT

is worth
a New Tire

It takes a small hole or curb-cut to start a big blow-out. But it only takes a few minutes' time to fill this hole with **Knead-It**—and save that tire.

Anything sharp will cut your casings—sand and water will work in, which soon rots the fabric—bang goes your tire!

Buy a can of **Knead-It** to-day and seal up those cuts when they occur.

You—your chauffeur—or anybody can permanently repair every injury that will happen to your casings, absolutely without vulcanizing.

Simply knead a pinch of **Knead-It** between the fingers and stuff it into the cut—a child can do it.

It becomes as tough and elastic—as the tire itself—in fact, becomes part of the tread.

Knead-It increases tire service threefold. 50 cents a can and sold on the money-back plan.

For sale at all Automobile Supply Dealers, or, if sent direct, include 4 cents for postage.

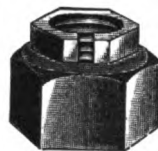
MANUFACTURED BY

The M. & M. MFG. CO. Akron, Ohio

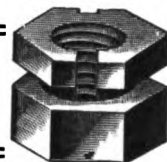
A postal will bring our new booklet, "Money Saving Facts About Auto Tire Repairing"



A NECESSITY ON AUTOMOBILES!!!



ORIGINAL.



IMPROVED.

What?

COLUMBIA LOCK NUTS.

They Will Not Shake Loose.

A LOCK NUT, NOT A NUT LOCK.

Our "Green and Yellow" booklet tells "WHY" ordinary nuts shake from bolts and "WHY" the "COLUMBIA" don't.

No Tool Box should be without a package of assorted sizes—100 pieces, 5/16 inch to 3/4 inch, \$3.00. Put up by our agent,

DANIEL L. TOWER,

107 Chambers St., New York City.

COLUMBIA NUT AND BOLT CO., Inc.,

BRIDGEPORT, CONN.

Discounts to the Trade and Car Builders.

AUTOLINE

TRADE MARK.



The Oil That Saves the Motor.

A trial will convince you that it is the **Best Automobile Cylinder Oil** on the market to-day.

Grades: Light, Medium, Heavy.

Write immediately for literature giving full particulars.

— MANUFACTURED BY —

WM. C. ROBINSON & SON CO.,

1507-1511 Thames Street,

BALTIMORE, MD.

New York, Philadelphia, Boston, Chicago, Pittsburg, Cincinnati, Indianapolis, Terre Haute, Charlotte, Savannah.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

IT GETS AT THE HEART OF THE PUMP QUESTION



PATENTED

TIRES ARE EXPENSIVE: AIR IS FREE
WRITE FOR CATALOGUE

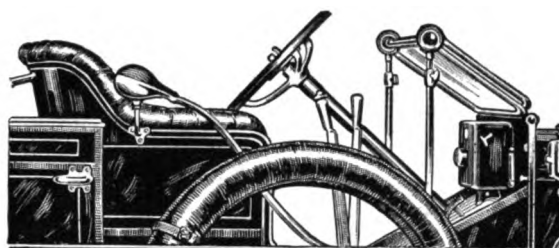
Remember, running with a flat tire, even though only for a short distance, is sure to be costly

Agents Wanted Everywhere

Send for our proposition

Hawthorne Mfg. Co., Inc.
7 SPRUCE STREET
BRIDGEPORT
CONN.

HAWTHORNE FOUR CYLINDER HAND AIR PUMP.



Know an Auto from Hood to Tires

Expert knowledge of automobile construction is essential to car owners, repairmen, and drivers alike. To the owner it means certainty when judging a car, and a great saving in cost of up-keep. To the repairman, or driver, it means a greater demand for his services, a larger salary, and a permanency of position. To all it means knowing if a car is right, and when not right, exactly what to do and how to do it.

All this valuable knowledge is set forth in the Automobile Course of the International Correspondence Schools. The subjects covered are: Gasoline Automobiles, Gasoline Automobile Engines, Automobile Engine Auxiliaries, Automobile Carburetors, Electric Ignition, Transmission and Control Mechanism, Bearings and Lubrication, Automobile Tires, Automobile Operation, Troubles and Remedies, Overhauling and Repairs.

This Course has been prepared by recognized experts actually in the business. In other words it is practical as well as theoretical.

To learn all about it, and how you can most easily become an automobile expert, write today to

International Correspondence Schools
Box 1413, Scranton, Pa.

REVOLVING CASES



No manufacturer, dealer, or repairer of automobiles should be without our Cases. They occupy but a small space and capacity is very large. Each case guaranteed to give satisfaction. Used for bolts, screws, and small parts. Made in 82 different styles and sizes. Send for catalogue and price list. Manufactured by

AMERICAN BOLT AND SCREW CASE CO.,
Dayton, Ohio, U. S. A.

A RECORD BREAKER



Blue Ribbon Cream METAL POLISH

The Original Cream Metal Polish. Accept no substitute

A Swell Polish for a Swell Car **Makes Any Car Look CLASSY**
Remarkable for Quick Action—Brilliant Lustre—Lasting Finish.

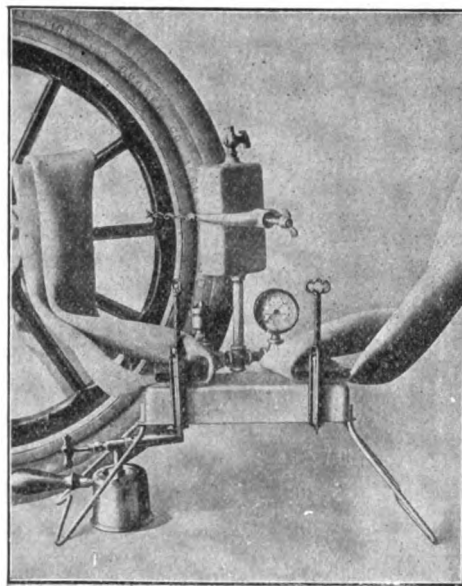
Instantly Dissolves and Removes the Tarnish—not the Brass. Leaves no White Deposit or Sediment. Essential to the Up-to-date Garage.

Ask your Dealer or Write for Sample.

International Metal Polish Co.
2140 N. Capitol Ave., Indianapolis, Ind.
Madison Square Show Space No. 415, 2nd Tier.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

The
**Pittsburg
Portable
Steam
Vulcanizer**



For the Owner or the Garage

Weights less than ten pounds. Can be carried in the tool box and used on the road, in the house, or in the garage. Steam generated in five minutes with gasoline or alcohol, or with natural, artificial or acetylene gas. No experience required to make repairs to both inside and outside of casings, or punctures and blow-outs in inner tubes.

Ten-day Trial Proposition

Sold with a Money-back Guarantee

By means of our Inside Tire Vulcanizer, a blowout or section ten inches long can be repaired with one-half the material used by the average repairman, and the repaired part will be stronger than any other part of the tire.

WRITE FOR BOOKLET and PRICES.

Motor Tire, Repair & Supply Co.
Dept. 3

Pittsburg, Pa.

NOTICE TO THE AUTOMOBILE PUBLIC.

WE ARE THE ORIGINATORS OF THE
IMPERIAL TIRES

WE ARE THE ORIGINATORS OF THE SYSTEM OF SELLING
FIRST TIRES UNGUARANTEED

The Imperial and Independent tire is made by an improved process employing a much heavier fabric and an extra layer more than used by the mills that originally made these tires for us.

"IMPERIAL" TIRES "INDEPENDENT"
(Moulded) (Wrapped)

Clinchers, Dunlops, Q. D. Clinchers.

Size	Unguaranteed	Guaranteed
28 x 8	\$10 87	\$18 85
30 x 8	12 23	15 15
30 x 8½	16 31	21 75
32 x 3½	18 83	23 10
34 x 3½	19 70	26 27
30 x 4	20 38	27 13
32 x 4	21 74	28 98
34 x 4	23 77	31 69
36 x 4	24 71	32 94
34 x 4½	29 00	38 66
36 x 4½	30 67	40 90
36 x 5	34 67	46 23
37 x 5	35 36	47 14

THE SAME TIRE

Write for prices of other sizes.

Tubes in proportion. Q. D. Flaps one dollar extra. State style and make of rim in ordering. Money refunded on goods returned intact within a week and shipped with privilege of examination, if requested.

AUTOMOBILE TIRE CO., Inc.

ED. C. GRIFFITH, Pres.

Tel. Col. 5386.
Cable, Autotires.

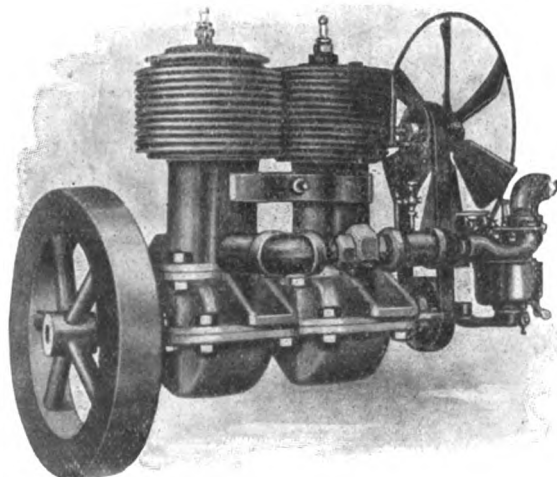
1625 Broadway, New York City

The Oldest Auto Tire Jobbing Concern in the U. S.,
and Largest in the World.

THE CLIMAX TWO CYCLE ENGINES ARE WORTH INVESTIGATING

No matter how good your power plant, we can improve it

Sate
Simple
Reliable
Economical



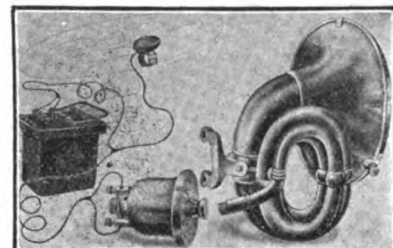
10-12 H. P. Air Cooled Motor. Weight, 138 lbs.

More reliable than a four cycle engine. Surer to go and quieter. And the price! We can astonish you and help you to meet all competitors.

Free catalog and liberal discounts to manufacturers
Write to-day for their history and prices

CLIMAX ELECTRIC WORKS

New Salem, Mass.



GRACK-UNICUM ELECTRIC HORNS

Far superior to the old style pneumatic horn.

Write for Bulletin No. 21

Theo. H. Gary Co., 22 E. 17th St., New York

Fuel and Ignition Cut Out

Saves about 20% of gasoline and batteries.

It gives instant control of your engine.

If your dealer does not handle them, write direct to factory.

Price list and circular sent on request.

MOLLER BROS.

Box 42

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PALMER MOTORS AND LAUNCHES

Two and Four Cycle. One, Two and Four Cylinder. Stationary and Marine. One to Thirty h. p. Catalogue A FREE.

PALMER BROS., Cos Cob, Conn.

New York, 31 E. 22nd St.; Philadelphia, The

Bourse; Boston, 85 Union St.; Providence, R. I.,

243 Eddy St.; Portland, Me.,

Portland Pier; Seattle, Wash.,

905 First Ave., S. I. Vancouver,

R. C. 14th Powell St.



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*Will you let us
send you
this
valuable
Book FREE*

A new and practical book, 48 pages, compiled from the most instructive and practical articles written on the subject, boiled down to meaty facts, presented in clear, concise, unmistakable language, so that every user of an Automobile or a Gasoline Engine owning this book can know his own ignition system and how to conquer ignition difficulties. Filled to the brim with practical hints.

You need this book—send for it to-day.

Go Over This Partial List of Subjects Treated:

Source of current supply,
Batteries,
Induction,
Magneto, High and Low Tension,
How to adjust Vibrating Coils,
Action and purpose of "Condensers,"

Changing time of spark,
Wiring Timers,
Practical electrical units and standards,
How to locate Ignition troubles,
How to make adjustments.

*Fill
in
and*

Magneto
Type at
\$1.25
Regular Type
at \$1.00

Reliance

(REG. U.S. PAT. OFF.)

SPARK PLUGS

produce a more intense spark and use less battery power than any other plug. Absolutely soot proof, and carbon proof, do not require cleaning because they are proof against any and every combination you can find in a gasoline engine cylinder. Are absolutely infallible when short circuiting matter is encountered. Reliance Magneto Spark Plugs cannot foul even when an excess amount of oil is used.

Sold by leading jobbers, dealers in auto accessories everywhere. If your dealer can't supply you, order direct from factory; shipped to you prepaid at the prices quoted.

Jeffery-Dewitt Company

Makers of Reliable Spark Plugs
53 Butler Avenue, Detroit, Mich.

Armand Frey and Company
Berlin, Germany,
Agents for Continental
Europe



*Mail
this
Coupon*

JEFFERY-DEWITT CO. (Auto. D. & R.)
53 Butler Ave., Detroit.

Please send me your book, "Ignition and Spark Plug Talk."

Name.....

Address.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

—OUT—



The Complete Plug
as Used.

Price \$1.25

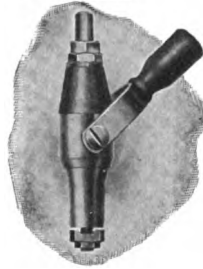
The 1911 Perfected "Winestock" Q. D.

Spark Plugs

Always was good.
Became better.
Is now the best.

Try Them

1. Detachable in second without tools.
2. Adjustable Spark Gap.
3. Can take out to test or clean while motor runs.
4. Gives very strong spark.
5. Cannot break—Does not foul.
6. Shell is priming cup.



The Entire Plug.



The Shell or Priming
Cup.

Send in this ad. It entitles you to 25 per
cent. discount when accompanied by the cash.

Knapp-Greenwood Co.
Boston, Mass.



SAFETY
SERVICE
SATISFACTION

10,000 Miles

The tire that will do this is the King. Here it is in a nutshell. It has all the merits of the best rubber tire—it hasn't one of the rubber tire defects. Acknowledged to be the ideal touring tire. It is something different—in a class by itself.

We guarantee from 5,000 to 10,000 miles, according to size, and against rim-cuts, punctures and blow-outs. Our special armor cover of steel studs prevents skidding.

Write for literature if you are interested.

We make complete tires—not covers.

King Leather Tire Co.

3446 Vliet Street

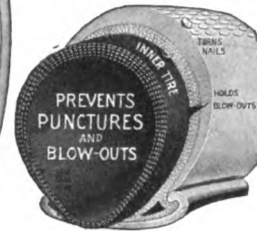
Milwaukee, Wis.



THE MURRAY PATENT "INNERLOCK"

INNER TIRE

Is a Complete "Tire
Within a Tire."



Provides greatest mileage at lowest cost and reduces tire trouble to a minimum. Makes all tires, including old, weak and overloaded last until worn clear through—and then can be removed and used again.

The Best Tire Re-Inforcement

Being made four to six ply (as heavy as the tire) of patent construction cross laid fabric with self-sealed flap so that it fully re-inforces the sides (always the weakest point) making a BLOW-OUT, RIM-CUT or PUNCTURE ALMOST IMPOSSIBLE.

Also Largely Used in Taxicab Rental and Commercial Cars

Equip YOUR tires now and SAVE HALF your expense—the earlier placed, the greater extra mileage gained.

Agents and Dealers

wanted to handle this fast selling proposition. A full line of Blow-Out Patches and Reliners. There's money in this for you if you act quickly. Write for territory and proposition to-day. It's a winner.

DOUBLE FABRIC TIRE CO.

18 East 7th Street

Auburn, Ind.

BALL MULTI-SPARK PLUGS



Give a hotter spark than any other plug made and therefore explode a thinner mixture of gas. Therefore more power and less carbon.

Bear these points in mind and insist upon no other in your motor equipment.

Sold by good dealers everywhere.

Price, \$1.50.

Booklet and descriptive matter for the asking.

"The Plug with a Guarantee."

THE BALL MULTI-SPARK PLUG CO.,
917 HENNEPIN AVE., MINNEAPOLIS, MINN.

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LABEL COPYRIGHT 1908
BY INNER SHOE TIRE CO.

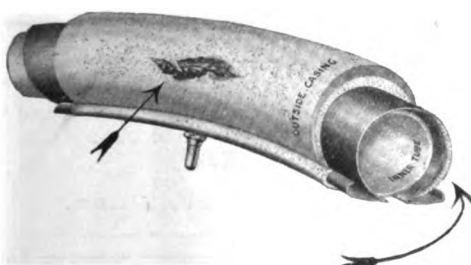
THE **SHUR-HOLD** **WAY** IS A

**Genuine Joy
Genuine Safety
Genuine Get You
Home Way**

READY FOR USE



IN PLACE IN TIRE



**WILL HOLD BLOW-OUTS AND
PUNCTURES PERMANENTLY**

**AN EXTRA TIRE NOT NEEDED
WITH A SHUR-HOLD IN YOUR TOOL BOX**

For 3 Inch Tires, \$2.25

" 3½ " " 2.50

" 4 " " 2.75

" 4½ " " 3.00

" 5 " " 3.25

**Of Your Dealer or Post Paid Cash
With Order**

**NONE GENUINE WITHOUT THIS
LABEL ATTACHED**



Please mention the Automobile Dealer and Repairer when writing to advertisers.

Just
the thing
for
Floors and
Running Boards
of
AUTOMOBILES
also

MOTOR BOATS
Not affected by gasoline, oil
or grease. Made in any color.
Samples and prices furnished upon request.

THE NAIRN LINOLEUM CO.,
NEWARK, N. J.

W. & J. Sloane, 888 Broadway, NEW YORK CITY,
Sole Selling Agents.

LIN-RHUBER

Gasoline Self-Measuring Pump

Our Model,
shown herewith, will
quickly pay for
itself in any garage.

Convenience,
Economy,
Safety.

Not one drop of
Gasoline wasted.

Gasoline Tanks,
Pumps,
Complete
Storage
Outfits.

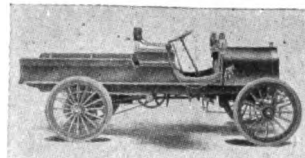
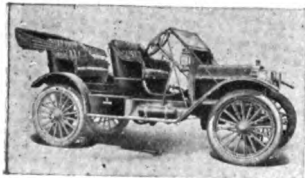
Get full infor-
mation by
writing to

Eastern Oil Tank Co.
Lowell, Mass., U. S. A.



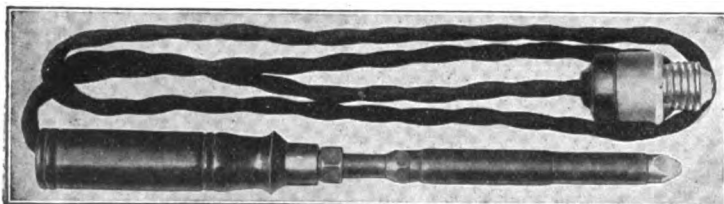
The Gearless, Clutchless, Valveless Kearns Cars for 1911

Built for the non-mechanical man, woman or
child. Friction driven.
Air or water cooled 2
cycle motor. Solid or
pneumatic tires.



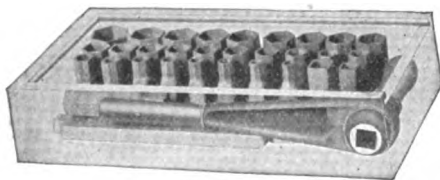
Agents wanted in uncovered territory.
Ask for Proposition NOW — To-day.

KEARNS MOTOR CAR CO.
BEAVERTOWN, PA.



ELECTRIC SOLDERING IRONS FOR
Radiator Repairs. We make a special copper tip
for this work. The same tool can be used for other work
by simply changing the tips. Sent on trial to responsible
parties. *Write for particulars.*

NILSON-DILLENBECK CO.,
135 Adams Street, Chicago, Ill.



Reversible Ratchet Wrenches All shapes and sizes

If your dealer does not have this Automobile Wrench in stock, ask us and we
will tell you who has. After 40 years of experience, we stand back of all we
put out. Circulars mailed free on request.

LOWELL WRENCH CO., Worcester, Mass.

DURYEA BUGGYAUTS



Seven Styles. Built for business.
More simple than you can imagine.
No revolving parts except crank-
shaft and wheels. In a class by
itself. Most miles, least cost. My
catalog will save you much money
and worry. Write to-day:

CHAS. D. DURYEA, Reading, Penna.

SECTIONAL TIRES FOR AUTOMOBILES

Not a solid rubber tire, but the most
resilient combination of rubber and
air ever devised.

DO YOU WANT AN AGENCY?

SECTIONAL RUBBER TIRE CO.,
WOLLASTON, MASS.

ATTENTION E-M-F OWNERS.

WE HAVE adjustment fixtures for
E-M-F push rods which make accurate ad-
justments and does away with noise and
rattle.

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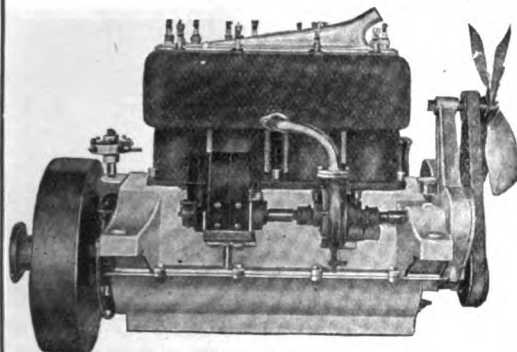
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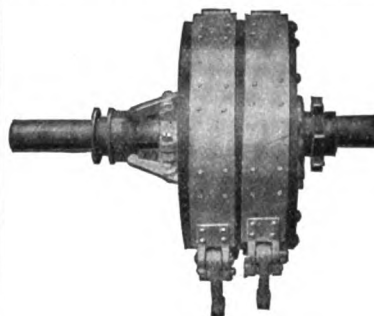
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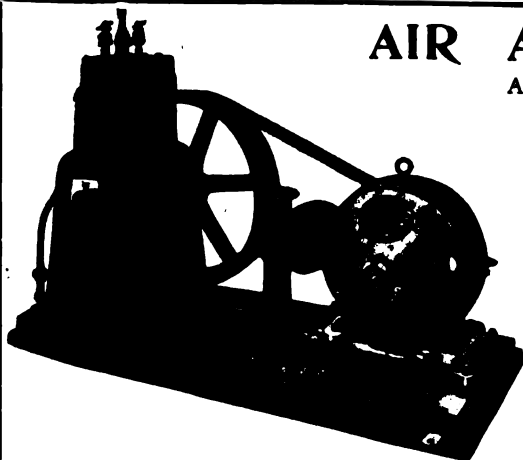
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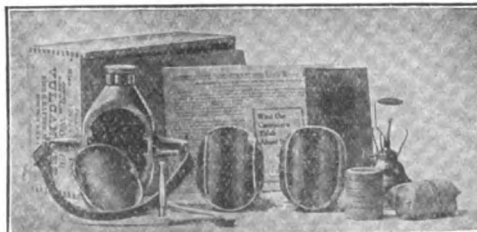


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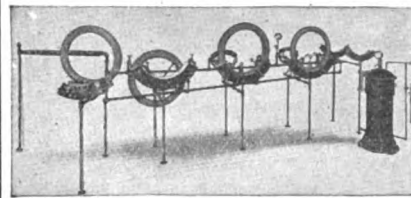
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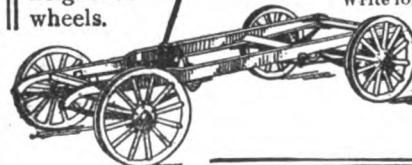
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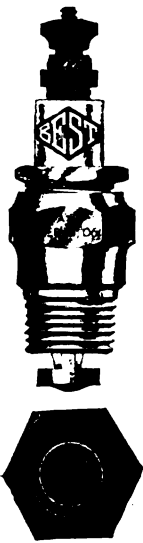
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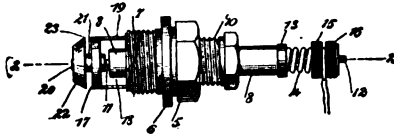
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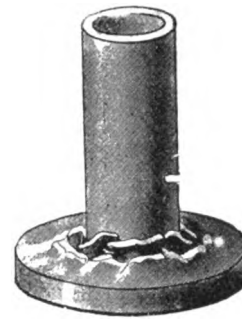
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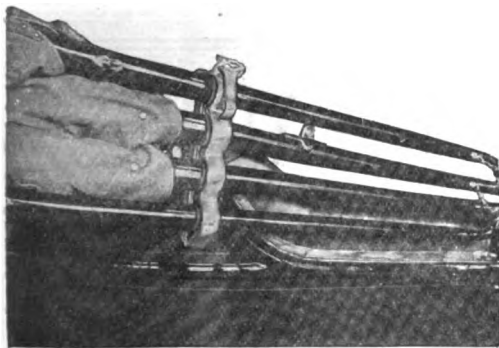
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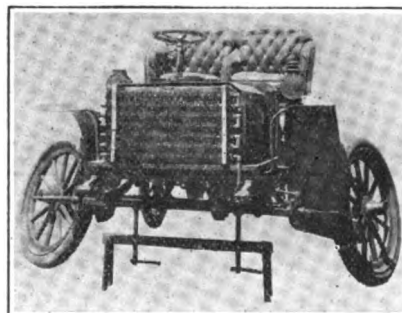
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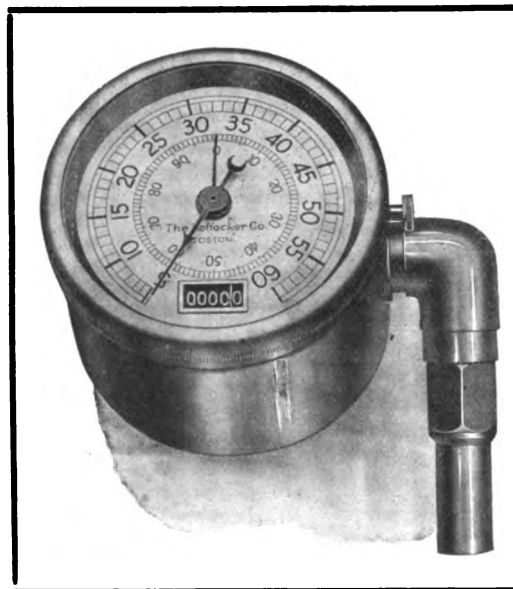
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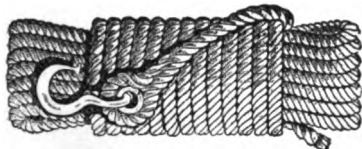
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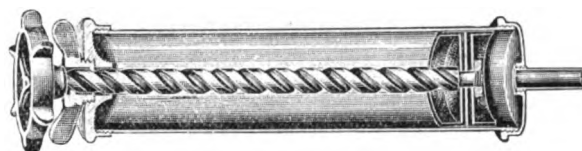
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EASY

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Loosened In A Moment

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Ratchet Teeth Will Hold Where You Put Them

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Easily Attached to the Straps Now On Your Top

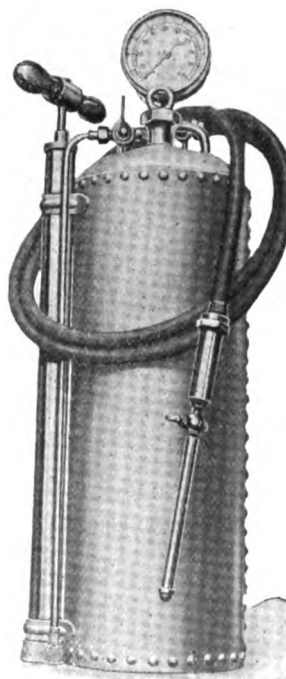
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Put 1 gallon of gasoline
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of 80 to 100 pounds. Close
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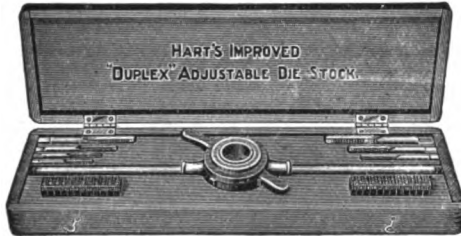
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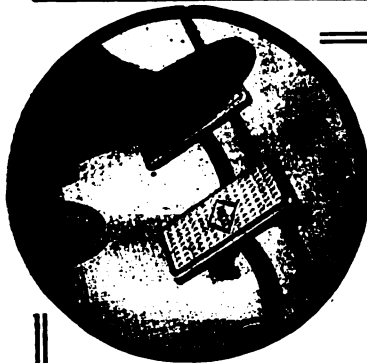


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Supposing You Are Driving An Automobile

Going at a moderate speed, say 20 miles an hour— even then you are covering 20 feet per second— suddenly, without warning, something turns up on the road—

**YOU NEED YOUR
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To any reader of this ad, who sends us \$1.75 and the name and model of car, we will mail 1 pair APCO Pedal Grips. IF a copy of this ad. is sent with order.

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Tires Inflated to the Right Pressure

He insists that this is tire economy and

Saves You Money

How do you know what pressure you have in your tires?

(Trade Mark Registered in U. S. Patent Office)



(Patented March, 1893—Other Patents Pending)

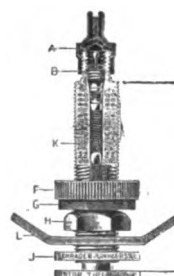
A Schrader Universal Tire Pressure Gauge

will tell the exact pressure in your tires at any time, day or night, by simply holding this Gauge to your valve for a second. Its recording sleeve remains in place, showing the exact pressure in the tire so that the Gauge can be taken anywhere and read at night, to the front of the car into the light of the lamps. After the pressure has been ascertained the Indicating Sleeve can be pushed back into the Gauge with your finger. No catches or snaps to operate or get out of order. This Gauge is $2\frac{1}{4}$ inches long over all, short enough to apply easily to the smallest diameter of wheel and can easily be carried in the vest pocket or the change pocket of your trousers.

Each Gauge comes Packed in a Neat Leather Case.

**PRICE \$1.00 EACH,
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**GUARANTEED SIMPLE
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Simple and Absolutely Air Tight

Schrader Motor Tire Valves, as shown in cut, are the regular equipment for G. & J. style Motor Tires, whether used on ordinary rims or demountable rims, such as Michelin or Continental Ready-Flated Tires, and are also used on Hartford Detachable, Flak Detachable and New Goodyear Detachable Motor Tires.

Our No. 777 Motor Tire Valve is the standard for $2\frac{1}{4}$ inch and 3 inch tires, and our No. 725 Motor Tire Valve is the standard for tires larger than 3 inch.

Schrader Universal Valves, as shown in cut, and in different modifications, are used on all Bicycle tires made in this country.

These Valves and Valve Parts can be obtained from all tire manufacturers, jobbers and dealers, or

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VOL. XI, No. 1.

NEW YORK, MARCH, 1911.

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AUTOMOBILE INFORMATION.

Good Reading for Buyer or Owner from a Disinterested Expert.

From C. J. Pembroke, New York.—Information about the construction, care and use of automobiles and their varying mechanisms the sole object of which is to sell some particular make of machine or equipment are generally so narrow as to be of no real value to the prospective purchaser, who is looking for advice. I believe that an article on this subject from an uninterested source would be of value to the reader, and this is the only apology for its appearance.

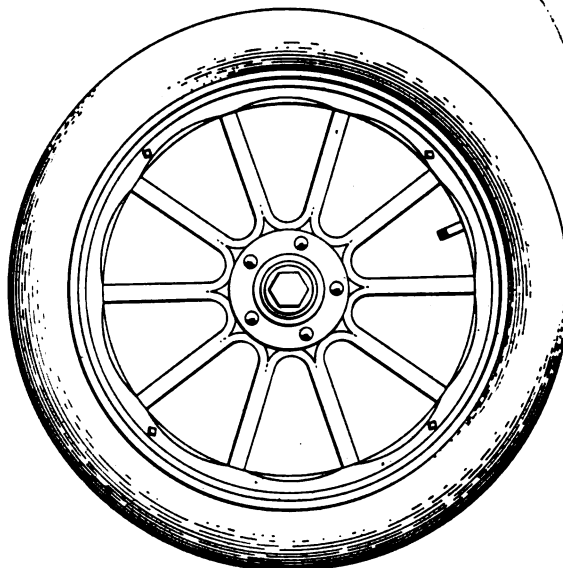
We will start at the tires and go through to the top, taking up each part in its order and discuss its various features, trying to separate the good from the bad, and give the reason why.

As only those things that make for the owner's comfort and pleasure, for freedom from repairs and economy in proportion to power are to be considered it will be necessary for those whose pocketbooks are limited, to come as near to the ideal as possible.

Tires.

This is a subject that has been worn threadbare. Thousands of articles have been written on the subject and even to-day you will find brothers, fathers and sons of long experience in the game, to say nothing of friends or strangers, who will disagree as to which is the best tire. One will tell you that the moulded tire is the real thing, while the next man you meet will tell you that he would have nothing but the wrapped tread. But right here let me tell you that the tire which will run the most miles with the least number of cuts in the rubber that are deep enough to expose the fabric to the elements, will ultimately prove out to be the best even if the fabric is not as good as in some other tire, because a poor fabric protected from the elements will give far greater service than will the best fabric not well protected. Now this gives us a lesson in which we have learned that we should have these cuts, punctures, etc., repaired at once before the moisture entering them has rotted the fabric, and by observing our own tires and those on other machines we can soon draw our own conclusions as to which tires cut the least. It only takes a minute to stop and look at a machine that stands at the curb and note the condition of the tires as to cuts, also to form an opinion as to the amount of wear they have given as well as to note the name on the casing, and if we find that one make always appeals to you, which will be the case if you will take the trouble as I have done, it stands to reason that all of these tires are not new; but that due to the rubber of the tread being tougher than most tires they do not cut as quickly. Of course I have a particular tire in mind but were I to tell you its name in this article the whole force of what I have said as in many things I will say hereafter would be lost, as you would say "pretty slick advertising," and in which statement you would be justified.

If the tire manufacturers dated but to speak the truth they would tell you that tires which are too small for the machine, caused more tire trouble than any other feature entering into the game, but were they to publish tables that would show just how large the tire should be, then all the automobile manufacturers who are using tires that are nowhere near large enough to carry their cars, in order that they may save a large amount on this item of cost, would not buy their tires. The tire maker, however, has already proved this statement by making odd size tires that will fit the next smaller rims and offered these to you who have been stung with wheels that are too small and as I am not handicapped by any obligations I gladly offer the following table for those who may



Demountable rim.

care to use it. In using this table simply figure the cross section area of one tire, and divide the weight of the machine by figure arrived at as the table assumes that four tires are used.

With 30-in. tires machine should not weigh more than 166 lbs. for each sq. in. of area.

With 32-in. tires machine should not weigh more than 177 lbs. for each sq. in. of area.

With 34-in. tires machine should not weigh more than 188 lbs. for each sq. in. of area.

With 36-in. tires machine should not weigh more than 200 lbs. for each sq. in. of area.

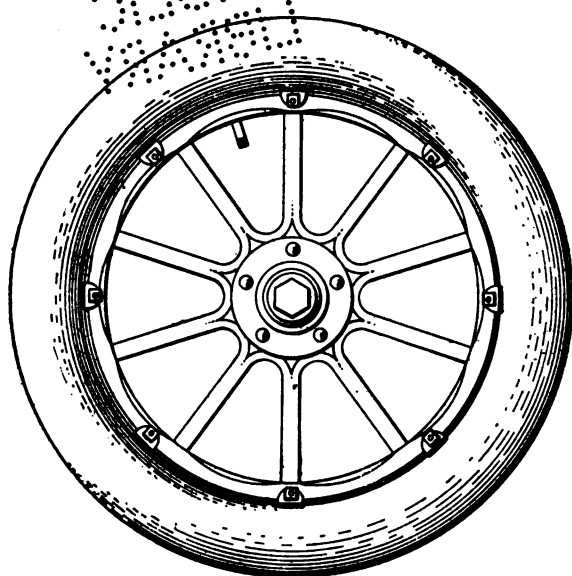
With 42-in. tires machine should not weigh more than 233 lbs. for each sq. in. of area.

Example: Machine is equipped with 36 in. x 4 in. tires. How much can it weigh? By squaring the diameter of the tire we get 4×4 or 16 square inches. Then multiply by .7854, which is the relation of the area of a circle to the square of its diameter, and we get 12.566 square inches cross section area. Now by looking at the table we find that a 36-in. tire will support 200 lbs. for each inch of area, so we multiply

200 by 12.566 and we find that the car should not weigh more than 2,543 lbs.

Those who can least afford to own a car are the ones that should be sure that the tires are not smaller than the limits given, and as nearly every car on the market is equipped with tires smaller than these limits it will be necessary to make special arrangements with the agent in order to get them, and it will be good investment to pay the little difference at the start, otherwise this large item in the expense of operating a car may run into an enormous amount.

On anything except the smallest runabouts, nothing smaller than 34-inch tires should be used, while 36-inch tires are much better and I would even be in favor of 42-inch tires on large cars, but as this size of tire is only used on a limited few, also as they look out of proportion unless the car was designed for them I refrain from advising the prospective purchaser to insist on their application to the new car of his choice, but inasmuch as the difference in cost between the



Detachable rim.

32-inch wheels and that of 36-inch wheels is not more than five dollars to the maker, and also as the difference in the cost of the tires is but a trifle compared with the extra service they will give in the life of the car, it would many times repay the slight difference that the maker would ask.

Plenty of buyers have purchased a car of the moderate priced class, of which there are a great many on the market, with tires of 30 and 32 inches diameter, and as small as 3 inches and $3\frac{1}{2}$ inches cross section, and then they have wondered why their tires would not give more than 1,000 to 2,000 miles when they knew that most tires are guaranteed to and should give at least 3,600 miles, and in fact if the automobile manufacturers had not cut the size of the tires down to meet the low price of cars the tire makers would not have reduced their guarantees from 5,000 to 3,600 miles, but they were forced to do it, knowing that their tires could not stand up under the excessive loads.

Inasmuch as I will state under the head of rims that I have no use for the demountable rim and as the reason is really a matter of tires it might just as well be threshed out now before we leave the subject.

The statement I make is that the extra tire is going to the bad almost as fast as the one on the wheel and that the extra rim and tire are not necessary. Now

this statement is based on eight years' experience with various autos and forms of tires. The writer carries instead of an extra shoe a piece of burlap 8 inches wide and 6 or 7 feet long. When a blowout is experienced, it is simply necessary to take the new tube, and after pumping it up just round, being careful not to stretch the rubber, hold the tube up to the rim with the valve opposite the hole where it goes through the felloe and note where the blowout comes on the tube. Take the burlap and start 8 or 10 inches one side of the blowout, and wrap the tube in a spiral manner, progressing one inch along the tube at each winding until a point about the same distance beyond the blowout has been reached. This will give you seven thicknesses of burlap at the point of blowout. Insert tube in the shoe. Let out the air that was used while wrapping. Put on the rim and pump up the tire, when you can proceed on your journey. Now this will fix a 12-inch rim cut or blowout and will hold good for 100 miles, giving plenty of time for a new shoe to be obtained, and for small blowouts of only an inch or so will make a permanent fix, that can only be equaled by actually vulcanizing the shoe, when it is still good policy to leave the burlap in place to strengthen this otherwise weak spot.

If it becomes necessary to cement a patch on the inner tube don't get it into your head that this can be done properly in five minutes' time, for it cannot. In the first place both tube and patch must be thoroughly cleaned with gasoline and should be roughened up with sand-paper so as to give the cement a chance to get a good hold on the surface of the rubber. Now give both tube and patch a good coat of cement, then wait twenty minutes by actual timing, before applying the patch, which is done by folding both outer edges of the patch together causing a sharp bend in the middle. Now apply this bend to the tube and allow the edges to come down slowly, so as to force the air out from under the patch.

For those who are not familiar with the principle of how cement holds the patch to the tube, it might be well to explain that raw unvulcanized rubber (before having been treated with sulphur), is of such a nature that it will heal, or in other words amalgamate itself together without any assistance other than its own nature. Now it will be plain to anyone that the best possible cement is the crude raw rubber itself, and if some chemical could be found that would remove the effects of the sulphur, and again expose the pure rubber no cement of any kind would be required, but as this has never been accomplished, they do the next best thing by taking pure rubber and dissolve it in one of the chemicals in which it is soluble, such as benzine, gasoline, carbon bisulphide or chloroform, but best of all equal parts of methylated ether and benzine. But whatever solvent may be used it must be of a rapid evaporating nature and a sufficient amount used to make the resulting liquid quite thin. This makes a thin rubber composition that we call cement. This after being applied, loses its solvent by evaporation, which is the reason for waiting the twenty minutes after applying the cement before trying to stick the patch to the tube. But we may pump up the tire immediately after applying the patch for further drying is of no value. Never apply but one coat of cement, because there is not to the writer's knowledge another material that shrinks so much upon drying as rubber cement, and it is bad enough to be compelled to contend with the internal strains that are set up by a single coat (it is these strains that curls the thin edges of your patch) without applying more coats to make it worse, for these extra

coats of cement can do no good, because after we have once secured a surface of pure rubber nothing more can be done, except that I leave it to the reader to find out for himself whether or not the so-called acid curing compounds are of any further benefit to an otherwise well applied patch. My own mind is in doubt, having had excellent results both with and without. To roughen up the surface of the rubber when no sand paper is at hand, simply wash a large stone with gasoline and rub the tube or patch on it.

Don't run your tires so soft as to cause rim cuts or excessive bending at the sides.

Don't pump them up so hard that there is no chance

ter when air bubbles will quickly locate the trouble. Oil destroys rubber, so keep it off.

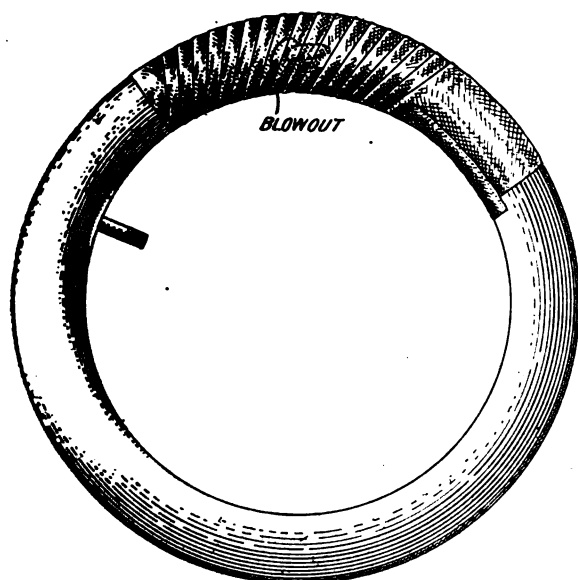
Rims.

There is no question but that the quick detachable rim of one form or another has come to stay because they have proven themselves to be a real success. They make it more easy to remove, replace and otherwise handle the shoe. They protect the inner-tube by not having lugs to chafe or pinch them, as there is no lugs to loosen up and creep, the nuisance of shearing off valve stems is done away with, then again the bead can and must be made stronger and stiffer, nor do we have to pry and bend the bead all out of shape every time we remove or put on a shoe, thus giving greater life to the tire.

There are several other reasons that favor the quick detachable rim such as the uneven strains that could not be avoided with the clincher rim for if the lugs were necessary then there was a tendency to slip or creep between the lugs, and as this creeping could go no further than the next lug where it was held firm, there must have been a buckle at this point that could not do otherwise than weaken the fabric, but as the writer believes that no one disputes the supremacy of the quick detachable rim it is useless taking up space to point out each little advantage.

As to the advisability or the future standardizing of the demountable rim, there is still some question, the answer being greatly a matter of choice, for there are plenty of drivers, like the writer, who never carry a spare shoe for the reason that it is a nuisance, is in the way, looks bad, and this spare exposed to the elements even if covered with a case that costs more money and which also goes to the bad, deteriorates almost as fast as one on the wheels.

When it is taken into consideration that the extra must be unstrapped from the car and the old one put back into its place, together with the fact that it takes longer to remove and replace a demountable rim than it does to handle a quick detachable rim for a change of tires, about the only thing that we save is the actual pumping while on the road. As an air bottle, or engine actuated pump will avoid this,

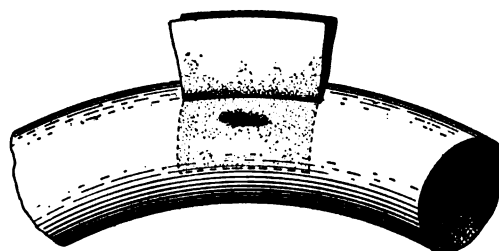


Wrapping for a blowout.

for the canvas to give to the inequalities of the road such as running over small stones, etc. To see the effect of this just take your handkerchief and hold it tight and then poke your finger up into the cloth so as to produce a sharp mound or point while under pressure. Then try and draw this point out smooth again and you will find that you have stretched the fibre so much at the point where the finger was applied that it will be bagged and cannot even be pulled out smooth and this is just what happens to a very hard tire every time you run over a small stone and which will so weaken the tire that after a while blow-outs will come at these weak points. And when a tire is pumped up so that it is round it offers only the least possible contact with the road, resulting in both loss of power and scrubbing out of the rubber surface. It also makes a very small amount of surface stand all the wear and quickly wears the rubber down to the canvas on the tread. It also reduces road traction, thus causing your brakes to be less efficient, causes the wheels to slip easier when brakes are applied with still more scrubbing effect and makes the car more liable to skid.

A tread of one inch in length on the road surface for each six inches of tire diameter is about right, but a slight increase in this length will do no harm.

Test for leaky valve by pouring a few drops of water (not oil) in the valve stem. If no bubbling occurs the valve is tight. Test for a porous tube by painting with thick soap suds when small bubbles will appear all over the porous area. Test for slow leaks by pumping up slightly and submerging in wa-



Method of putting on a patch.

it leaves hardly an argument in favor of the demountable rim to offset its disadvantages, if we consider the fact that the whole operation must be gone through with when you get home anyhow.

There is one argument in favor of the demountable rim that must not be lost sight of for those who think that they cannot travel without an extra shoe and that is that it keeps the elements from the inside of this extra, and as it is the action of the elements on the inside of an extra shoe that is simply strapped to the car that does the damage, it would be my advice for those who insist on carrying an extra to have their cars equipped with demountable rims, so this

extra would be pumped up, thus keeping the elements out.

Wheels.

The wheels should be of hickory, well seasoned and of sufficient size to stand the strain, and as most wheels come up to these requirements it is only necessary to note that they are not small as compared to other cars of equal size, horse power, etc. Still it is important that each spoke be mortised and tenoned together where they join at the hub, so that the bolts that pass through the hub will engage more than one spoke. Wheels so constructed will not get loose at the hub from shrinkage, which causes the creaking and rattling of some wheels wherein the spokes are simply wedge-shaped where clustered at the hub.

Hubs.

These serve two purposes, that of holding the inner ends of the spokes in place, thus really forming a part of the wheels—so they could have been considered under that head—but as they also serve as the outer housing for the axle bearings they are always made by those who make the axle and not by the wheel maker and in automobile factories are not considered as a part of the wheels, but rather as a part of the axle. They are made from both cast iron and of cast steel, the latter is preferable only when greater work is actually applied than the holding of the wheel together and the holding of the bearings, such as when the live axle is employed and the keyway with the aid of the friction of the taper, must drive the car, making an extra strong tough hub necessary.

Brakes and Brake Drums.

The brake drums could also be considered as a part of the wheels as they are always either a part of the hub or are bolted to the spokes or both, preferably the latter. It is important that the brakes be large enough to properly handle the car without any undue energy being applied to the brake pedal, and while you would think this was a feature that every maker would be sure of, you will find to your sorrow that there are lots of cars which can be stopped in a proper distance only after excessive and laborious pressure has been applied to the pedal, due either to the brakes being too small for the car or that a sufficient leverage was not supplied for the pedal. The only way to tell is to drive the car yourself and try them out. A ten-year-old child ought to be able to stop the largest touring car with ease if the brakes are large enough and the leverage is sufficient. While on the subject of brakes don't forget that your engine is the best possible brake when descending a long or steep hill and that its use saves the wearing and burning out of the best brake on earth. Simply throw your car into low gear and you will find that by aid of the spark and throttle you will have perfect control. In other words the friction brakes were put on a car for the purpose of stopping it, and you were furnished with an engine, spark control, throttle and transmission for the purpose of controlling its speed, so do not try to control the speed with the brakes unless you like the pleasure of renewing them every few days. Be sure that the brakes are equipped with equalizers, otherwise you will have a fine time to get them so adjusted that they will brake each wheel to the same degrees.

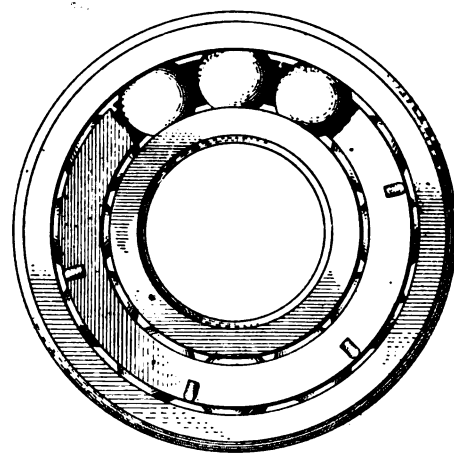
Rear Axle Housing and Rear Axles.

There is so many different forms of constructing the housing that it would take a small magazine in which to publish details of them all, so I will content

myself with a short description of the most used forms and then tell you which I think is best and why.

Practice has shown that they all serve the purpose of supporting the rear portion of the car with very few actual breakages, but there is a considerable difference when it comes to a question of weight, ease of taking apart, the removing or adjusting of the differential, appearance, etc.

These forms consist of cast iron centers or differential housings with steel tubes either brazed or riveted into them to form the ends. This style is differentiated by the use of cast steel, or malleablized iron centers, also by casting the center in one solid piece as used in connection with the floating axle, or divided in the middle and bolted together as used with the live axle, but in any of these forms it becomes necessary to use truss rods in connection with them so as to protect the joint where the tubes are joined to the central casting, and in the very best possible construction of any of these forms there must be used a surplus of



Sectional view of annular ball bearings.

metal and parts resulting in heavier than need be housing.

In contrast with the above forms is the pressed steel housing, and as a rolled sheet steel is several times stronger than the same thickness of cast steel or iron, and as it can be pressed to the exact shape wanted, metal can be placed where required. As there are no joints to be made, no allowance for these joints in thicker metal need be considered, resulting in the lightest, neatest, strongest and best possible form of housing which the writer believes would be on every car in existence were it not for the great cost of the mammoth presses and dies, and the expensive welding plants that must be used in connection with their production.

As the housing must be constructed to conform with the style of axle used, it is only natural that there should be several types of each of the above forms of construction. Those used in that which the writer thinks the worst of all forms—the live axle—where the housing must be joined in the middle and bolted together, making it impossible to remove any of the parts until after the car has been jacked up and the rear supported, the spring clips, the brake rods, the torsion rods, strut rods and other parts that may be attached to both frame and axle have been removed and the universal joints taken apart. Then the rear axle and its housing may be removed from under the car, after which you can get busy and remove the wheels, provided you have a wheel puller at hand with which to remove the wheels from the taper shaft to which they are tightly fitted. Then you can take off the truss rod and after removing a dozen

or more bolts you will be able to separate the differential housing in the middle. Now after you have taken out another half-dozen or so of bolts you will be able to separate the differential. Then by removing the nuts, cotter pins, etc., you will be able to separate the axles from the differential gear, and to get it back under the car will take the reversal of the operation, provided you have not broken or lost some of the thousand and one parts that you have removed. All of which will take you or some man that you are paying so much per hour, somewhere in the neighborhood of two days' time.

The semi-floating axle has many of the advantages of the full floating, inasmuch as the housing does not have to be removed from under the car, for in this type the axle is fastened to the wheels just the same as in the live axle construction, but is loosely fitted in the differential gear, which drives the axle by means of a squared axle end fitting in a squared hole in the gear. The housing being so made that the differential can be removed through the cover plate, it is only necessary to jack up the rear by placing the jack under the housing, remove the wheels by means of a wheel puller, then take out the screwed plate that holds the outer bearing, then you will be able to pull the axle out of the differential, all of which will take about one hour and the same to replace.

In the full-floating axle we get all of the advantages possible in rear axle construction, as we do not have to even put a jack under the car and after we have removed both axle and differential the wheels are still supporting the car, and as in this construction the axles have no other work to do than the actual driving of the car, and as this form can be completely removed from the car, together with the differential, in about fifteen minutes, it is the only style of rear axle that the writer would even consider when purchasing a car, no matter how good the rest of the machine might be built.

We might make a separate head for bearings, but as the same type of bearing is not adaptable for all

rollers are straight, roller bearings with tapered cones for bearing surfaces. Then best of all the annular ball bearing.

The rear axle should have 10 bearings in its construction, namely: Two in each wheel hub, two radial and one thrust in the differential, also two radial and one thrust for the driving pinion. Where the maker depends on the ability of the radial bearings to also take the thrusts it is bad practice, but of course saves the cost of two thrust bearings, and gives them a chance to soak you on repairs when these overstrained radial bearings give out, due to the double work that they are compelled to do.

As the differential is really a part of the rear axle construction we might just as well get it off the slate here as elsewhere, by simply saying that there is in general use two types. The spur gear and the bevel gear, due to the fact that all forms of friction and other types of patent equalizers do not seem to come up to the standard of construction, to a sufficient degree to meet with popular favor, and of the two types that are in use the bevel gear type is in the writer's mind so far superior to spur type, that I think the reader would think it foolish for me to even use up space to tell of the difference.

Concluded next month

WASTE IN DELIVERY.

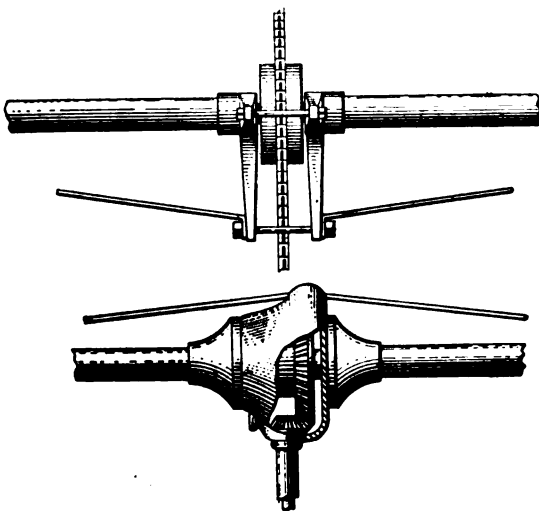
How Retail Merchants of One Small City Could Save About 75 Per Cent. Per Year.

From O. H. Hampton, Indiana.—There are in Richmond approximately 200 horses and wagons constantly engaged in the delivery of goods sold at retail. An itemized account of the cost of owning and operating one of these wagons for one year would be as follows: One horse, \$150; one wagon, \$150; one set of good harness, \$30; total cost \$330. 200 wagons and horses, \$66,000 invested.

Cost of operation for one year: Maintenance of horse, \$125, including barn rent; depreciation of horse, \$25; depreciation of wagon and harness, \$25; interest on investment at 6 per cent., \$19.80; driver's wages, at \$9 per week, \$468; total for one year, \$662.80; and for 200 wagons and horses, \$132,560 paid each year. It is large enough to interest every man who has to pay his part of it, and the consideration of some way to reduce this extravagant expense, is important.

It is a fact, that, under the present system, (or rather no system at all), of independent individual ownership a vast amount of travel is wasted, or, to make it plainer, arrangements may be made which will eliminate 75 per cent. of the present expense of both the original investment in property and the costs of operating expenses. To illustrate the present way of doing the business, suppose John M. Eggemeyer has a small order for North Twentieth street. He sends the goods at once, and before the wagon gets back to the store, some customer in the same block 'phones for something, and back goes the wagon to take the goods, and meanwhile, wagons from a number of other groceries are delivering in the same square. There is a vast amount of travel wasted. So much wasted that it takes \$132,560 each year to pay the bills. The plan to save 75 per cent. of this expense, is as follows:

Divide the city east of the river into four sections, as nearly equal in area as possible, also keeping in mind the amount of business in each section. West of the river, divide into two sections, one on each side of the Pennsylvania railroad tracks. Establish



Chain gear and bevel gear.

positions I think it best that we discuss bearings for each separate place while that part is under consideration, so for the rear axle I will say that for my use no other style of bearing comes anywhere near equaling the annular ball, and if I were to be asked to name in their order commencing with the poorest and ending with the best, the different bearings, this is the order in which I would place them: Plain bearings, cup and cone ball bearings, roller bearings whose

a receiving station at the intersection of the lines that divide the city, east of the river into four sections. Establish a rule that but five deliveries will be made each day, and a sixth delivery on Saturday evenings. Certain wagons are sent to all the stores in each section to collect goods and bring them to the central station, making five collections per day. Other wagons that make the deliveries to customers, take all goods that are to be delivered in their respective sections. No wagon, either collecting or delivering, ever goes out of its own section. These sections, it will be found, are practically one mile square, and practically all the stores are on north and south streets, except on Main street, and as there are about ten north and south streets in each section, approximately one mile long, it will take about 11 miles travel for each collection, or 55 miles per day for the five collections.

The delivering wagons would have a little more travel on account of having to deliver on the east and west streets, possibly ten miles more per day, so the average travel of all wagons on a section would be 120 miles per day. Now the writer happens to know that an average of 15 miles every day is all that a horse can do. It will, therefore, take eight horses in each section, and for the four sections east of the river, it will require thirty-two horses. West of the river and south of the railroad tracks, will take eight more, and north of the tracks, will take six. It is putting horses in that section a little thicker than on the east side, but it is to be remembered that they have a much longer drive to the receiving station, and their territory extends quite a distance to the west. The total is forty-six horses, and to these should be added four more, for out of fifty horses there will always be three or four in the hospital. We now have a total of fifty horses and wagons to do the work that formerly took 200. It has already been shown that the amount invested in the 200 horses and wagons used at present, is \$66,000. If fifty horses do the work, the saving will be \$49,500 on the investment. We have also seen that it costs \$132,560 a year to operate two hundred wagons. If the work is done by fifty horses and wagons, the saving will be \$99,420, to which it is proper to add 6 per cent. interest on the savings of \$49,500 saved on the investment, which amounts to \$2,980, making the total saving per year, \$102,360. If that is too big for you to swallow whole, try to get it down on the installment plan, for it is heap good medicine.

Now, before deciding whether horses or some other kind of transportation will be the cheapest, it will be good business to investigate motor delivery wagons, so nearly all the expense has been eliminated, that we want to get rid of all the rest that is possible.

Please excuse the writer for saying to you that he knows motor vehicles from the ground up, and that he will not say anything to you that he does not know to be facts, nor anything that he is not more than willing to substantiate by showing the vehicles in actual work, delivering or collecting goods; in fact, any sort of demonstration you may want, to convince you of its goodness or its badness.

First, you will be pleased with the neat and smart appearance of the vehicle; its abundance of room and its convenient arrangement for quick and safe handling of packages; its thorough protection of goods from rain, snow or dust, and the load of 1,800 pounds that they carry, in addition to the driver. They are thoroughly durable in every respect, and simple enough for any person of average intelligence to learn to drive them anywhere in a week, and to take proper care of

them. They run at any desired speed up to thirty miles an hour, start quicker, run faster, stop quicker and are much more accurate in control than any horse, and can safely be driven through traffic-crowded streets at twice the speed that a horse can be driven. It has many times been proven that a good motor vehicle can easily do as much work as three good horses, and that it is more reliable, as it is neither overcome by fatigue nor has to go slow on account of heat.

The idea, as given above, requires the use of forty-six horses. Sixteen motor wagons will do the work, and probably be able to bring most of your goods from the railroad freight houses to your stores.

Comparison of first cost and operating costs between the horse and the motor wagon would be as follows:

50 horse wagon outfits cost.....	\$16,500
16 motor wagons cost (\$1,000 each).....	16,000
Operating motor wagon for one year costs as follows:	
Gasoline and oil (average day's work of 60 miles) for one year.....	\$ 150
Upkeep of machine.....	50
Driver's wages (\$9 per week).....	468
	<hr/>
	\$ 688
For sixteen motor wagons.....	\$10,688
For fifty horse wagons, one year at \$662.80....	\$33,140
The saving per year by the use of motor vehicles amounts to.....	\$22,452

Recapitulation.

Present cost of delivery.....	\$132,560
Same work done by system and motor wagons	10,688
<hr/>	
Net amount saved by system and use of motor wagons	\$122,872
There are, however, two items of expense which have been overlooked, the interest on \$16,000 invested in motor wagons.....	960
and the cost of managing the business, probably	2,000
	<hr/>
	\$2,960

Deducting these items from the \$122,872 leaves a net balance of \$119,912 saved, if there are 200 members of the association, and their delivery expenses will be reduced to \$70 per year for each member. If there are but 100 members the saving to each one would be but half as much, as the same number of wagons would be required to do the work.

Objections.

The writer has canvassed and obtained the views of a large number of firms who would be interested. All of them admitted that their delivery expenses were a costly item in their business, and if there was any way to reduce them it ought to be done. On that point their views were unanimous. There were but few points of objection. One firm said their drivers were solicitors as well as drivers, and they could not solicit under the co-operative system. The objection is answered by the fact that none of the association members could solicit, unless they sent out special solicitors, which any of them might do if they saw fit, so they would all be on an equal level, and it would doubtless pay better if special solicitors were used

under the present way of delivering than to trust the matter to the wagon drivers.

It is objected that ALL the parties in interest could not be induced to join the association, and that people would not submit to five deliveries per day, but would insist that their goods be delivered immediately after they were ordered, and if they were not so delivered they would order from firms who were not in the association, because they would get goods delivered immediately. It is quite probable that a part of those who ought to join the association would not join it at first, but when they were made to understand that their investment in stock in the association would be no more than \$100 as against \$330 which they now pay for delivery wagon and horse, and the saving amounts to 75 per cent. of what it costs him by the old way, and that he has nothing to do with the delivery matter except to have his goods ready when the wagon comes, he will be glad to join the association.

If the whole scheme is gone over carefully, every one will be surprised that it was not gone into thirty years ago.

Here is another objection offered: That co-operative concerns don't hang together, and that the matter ought to be taken up and put through by some person or firm, and not by those interested. This objection is hardly worth attention, further than to remark that there are a lot of merchants who are interested that are capable of managing such a concern as well, or better, than any outsider could do it, and who is going to do it without figuring out a handsome profit for doing it? If the merchants run it themselves they do not have to pay anybody any profits for running it, and they have full control of it, and can run it as their needs demand.

If an outside concern does the work, it may not be done satisfactorily, and you have no recourse but to buy your own outfit and go back to the old costly way. The way is to be your own stock company and divide the profits among you.

Note 1.—The price paid for motor wagons ordered through the writer or direct from the manufacturer he represents, includes the training of one driver for each wagon purchased, until he is competent to drive it anywhere and take proper care of it.

WEARING OUT TIRES.

How the Clutch and the Brake Contribute More to It Than Anything Else.

BY JAMES F. HOBART, M. E.

Since writing the article on tire wear in the January issue, I have read the article on "Short Wheels" in the November, 1909 issue, in the seventh paragraph of which says: "Tires also suffer from the displacement of the front axle, which must be taken into consideration. The front axle not being parallel with the back, the tires on the front wheels are compelled to run in a vertical plane, different from the usual running plane."

Apparently, the above statement is what actually takes place, but upon carefully looking into the matter, it will be found that it makes very little difference, if any, as to how the front axle happens to be placed in relation to the rear axle. This may be more clearly seen and understood by reference to Figs. 1 and 2. The former shows the wheels of an automobile as they would stand in relation to each other were the shafts out of alignment (parallel with each other) as noted in the article quoted above. Wheels A, A, are not in alignment with wheels B, B, and an attempt to run

the vehicle with the wheels in the position shown would have the effect of driving the car around the circumference of a large circle, the radius of which depends upon the distance between the front and rear shafts of the vehicle and their angularity.

As each wheel of an automobile acts independently of either of the other wheels, there could be no tire wear caused by the lack of axle alignment for the reason that while the vehicle is rolling around the large circle, there can be no "side-swiping" of the tires as indicated in the November article, and when the automobile is made to go straightway by changing the angle of the forward wheels, there can be no side movement while they are in that position.

The manner in which the wheels line up with the rear axle, independent of the position in which they

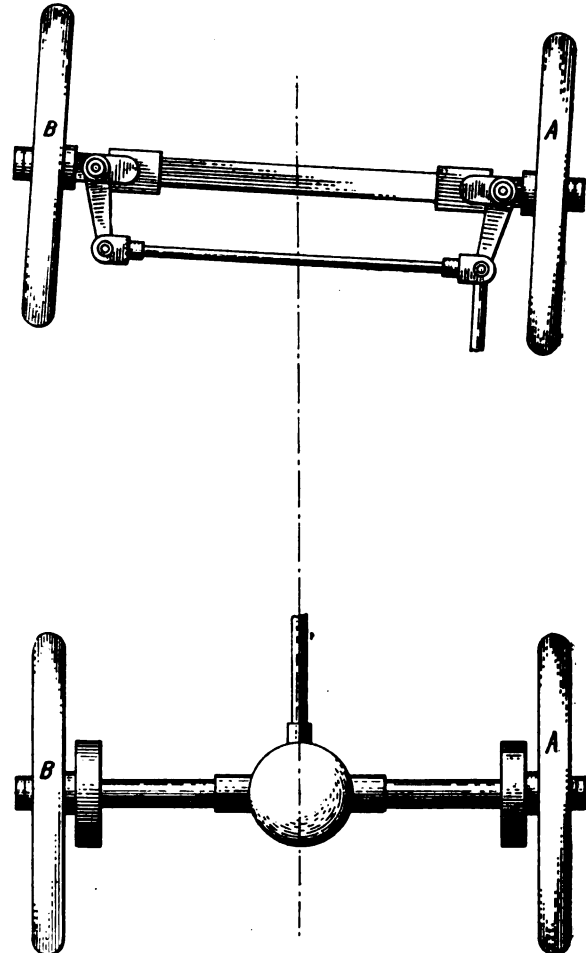


Fig. 1.

are placed as regards the front axle, is well shown by Fig. 2. In this engraving, wheels E, E, track perfectly and also lie in the same straight line, at right angles to the rear axle. Wheels F, F, occupy a similar position when the vehicle is moving in a straight line, or "along a tangent" for, according to engineering, a vehicle can make only two moves, either in a curve, or on a tangent, and this is a fact.

Hence, it will be seen that no matter how badly the front axle may be cut of alignment, the wheels must stand square with the rear axle when the vehicle is moving in a straight line, provided the forward wheels are so connected and adjusted, as noted in the January issue, that they stand parallel with each other. And furthermore, it makes little difference as regards tire wear, whether the axles are parallel horizontally, or not. It is the fact that the wheels are connected in

exact parallel with each other, which gives long tire life, and this point cannot be too strongly enlarged upon. It cannot be too forcibly hammered into the heads of automobile owners as well as drivers.

Some very interesting things come to light when investigating tire wear. Take any instance, and after ruling out all wear and tear caused by accident, foolishness and neglect, there still remains a great volume of tire wear, and when the cause thereof has been accurately determined, it will be found that the tire wear was caused by two things, and the wear due to each, is almost exactly equal. The names of these two great causes of tire wear are the clutch and the brake.

This statement must be taken to mean that all the power which moves and drives the car is exerted through the tires, and comes through or by the clutch. Also, any power which retards or stops the car, also comes through the tire and it comes through or by the brake.

Only last night, I saw a car come up to the curb at a twenty-mile clip, swing parallel therewith and stop in less than twice its length. I could hear the complaint made by the brake which was so powerful that as more and more pressure was exerted at the lever, the wheel actually vibrated as it slipped over the pavement. It did **not** slide, it simply jumped or bounded from one brick to another as it passed over the short distance necessary to bring the car to a stop. The tire wear was necessarily atrocious in a case like that. It was the old story again, of "didn't care, or didn't think." Either is bad, the other worse! Don't do it!

It may be added that this car, which had stopped at a restaurant, committed the other extreme of sins when it started away again. The driver worked the engine up to high speed with a couple of jerks of the gas and spark levers, then he jammed in the clutch so quickly that the car seemed to actually leap ahead. One of the occupants, a lady, was thrown back in the seat and her neck must have received a painful wrench when the car was so suddenly started into almost full speed ahead. The driver laughed as if he had done something smart. But his day of reckoning will come. Tire wear is getting him. Chain breakage is after him with a posse of deputies consisting of gear wear, loose connections engine knocks, shaft rattles and all under the immediate command of "General Looseness." His car for the repair shop, or for the scrap heap while our cars are still at their best.

Don't do stunts with the clutch and brake levers. Just imagine that there are eggs between the parts of clutch and brake and you must slip into gear without breaking a single shell. Then you will handle both clutch and brake in a manner which will make the times and all the machinery of your car run so smoothly and well that repairs will prove an almost unknown quantity!

There is also another piece of apparatus which has much to do with tire wear, and that is the steering wheel—its use, of course! The question may be asked how the manipulation of the steering wheel can influence tire wear either for good or for bad?

A good example of tire wear as affected by the use of the steering wheel took place when the automobile noted above, was swung alongside of the curve at the rate of 20 miles an hour. Clouds of dust were raised by the rear wheels and their tires swept the pavement clean in a pair of circular paths nearly fifteen inches wide each, where the wheels swept around and skidded, wiping the pavement clean of every vestige of dust.

The sharp curving movement of the machine caused the tires to slip sidewise and sweep the street clean, consequently there must have been a very large amount of energy manifested in the automobile at the time, to cause, or to allow the slip of the wheels, sidewise, under the weight of the vehicle. The force there manifested is that of the universe—centrifugal force. It is the making visible the effects of a portion of the energy stored up in the weight and velocity of the vehicle. And the amount of this force may be accurately calculated. The amount of work stored in any moving body is the product of its weight and its velocity. But the striking force of a moving body—provided the movement be arrested instantly—is the square of the velocity multiplied by the weight. But it is utterly impossible to stop any moving body in-

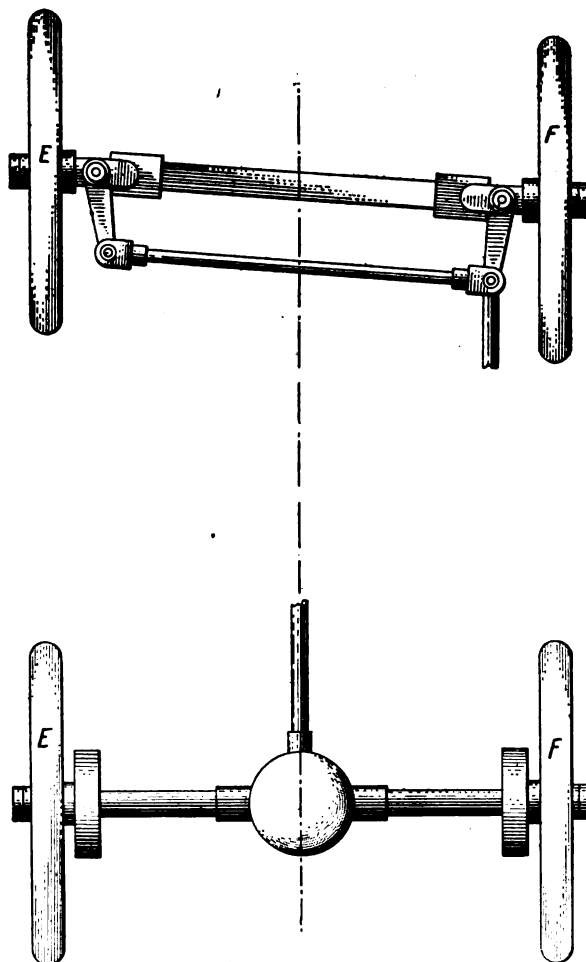


Fig. 2.

stantly. There will be some measurable or at least appreciable (calculable, at any rate) time in which the object is being stopped, and the product of the velocity—square and weight—noted above, must be divided by the time in which the stopping of the body actually takes place. Or, the divisor may be the distance the object moves while being stopped or brought to a state of rest. Thus, in case of a bullet fired from a rifle, the force of impact is the product of the square of the velocity of the projectile, divided by the distance which the bullet penetrates, or, in other words, by the distance the bullet penetrated the target.

From the above, it will be seen that the quicker the work of stopping a body in motion is effected, the greater will be the force to be overcome. And this also holds good in the turning or deflecting of a mov-

ing body from a straight line. The quicker the turn, the more power must be applied. If the object could be made to stop instantly and return in an opposite direction with equal velocity, then the force exerted in stopping the object would be measured by the square of its velocity method. But the instantaneous business is utterly impossible. The baseball, batted directly at the pitcher, is a fine example and the ball is by no means stopped instantly—and neither is the bat, which is moving in a direction opposite to the ball at the instant they meet.

There is a calculable and measurable time from the instant the ball touches the bat until it leaves it again upon its reversed direction movement, and this time is that in which the ball and the bat as well, is being compressed by the force of impact. For every substance upon the face of the earth, or in it too, is compressible to a certain degree—more or less—under pressure, even hardened steel, the diamond, and water. Although very slight, it is measurable and the law holds good without exception.

Thus, in the case of the automobile turning a corner at high speed, we find that the tendency of the machine to continue in a straight line (tangent) and its resistance to entering upon the new direction (curve) is exactly in proportion to the weight of the machine, its velocity, and the sharpness of the curve. Here we have the three quantities which govern the strain which may be placed upon a set of tires by running the machine around corners either fast or slow, and as the force due to weight and velocity is to be divided by the time or distance the work (corner turned) is done in, it is readily apparent that the longer the radius of the curve, the less will be the work thrown upon the tires. The above explanation of the mechanics of corner-turning also shows another and more vital point in the business. For instance, the weight of the car and the width of the corner turned are factors which act against each other and in certain cases, may be such as to neutralize each other. In such instances, the work at the corner depends entirely upon the speed of the car at the instant the change in direction is made. But here is where the heart of the matter lies. The work at that instant depends not alone upon the velocity of the car, but upon the square of its velocity, hence, if a car be running 20 miles an hour, or about 30 feet per second, its factor in the calculations would be 30×30 , or 900. But if the speed of the car be only 10 miles an hour at the time of turning the corner, then its factor would be only 15×15 , or 225. Thus, by reducing the speed of the car one-half when turning a corner, we put only one-fourth as much strain upon the tires through tendency of the car to continue on in a straight line (tangent) from which it is prevented only by the drag of the tires sidewise upon the ground. Necessarily this places a severe crosswise strain upon the tires which combined with the strain due to traction certainly puts upon a tire all that it can stand, and the more we look into this resistance to traction strains the resistance to skidding at corners, we can only wonder how a set of tires can possibly stand up long enough for the car to get back home. That a set of tires can and does sometimes last for years under similar conditions of use and misuse, seems almost incredible and it surely is an unanswerable bit of evidence of the skill and thoroughness with which the tire maker and designer has done his work.

It is the user of tires to which this article is directed. It is necessary that he realize fully the tremendous strains under which tires must do their work. Once this is realized, the tire user will find ways of favor-

ing tires—no, not of favoring them, but of giving them a chance.

There is one more cause of needless tire wear which is preventable to a great extent and which is caused by the sudden and hard shocks of impact when the car is driven rapidly over railroad tracks, rough wheel ruts in frozen ground and similar obstructions. While a good deal of this is actually necessary, much may be cut out by careful driving and the elimination of the crazy American notion of racing on every street or highway where an opponent may chance to be.

The actions of the car, when meeting obstructions are almost exactly like those when the car leaves a tangent for a curve. The principal difference is in the fact that the car is now beginning a vertical curve instead of a horizontal one. The calculations regarding the force transmitted through the tires when passing over a vertical irregularity, are the same as for going upon a curve. And the tire must sustain wear equally great for the weight and speed involved.

The moral is exceedingly plain: "Don't bump the bumps" or "curve the curves" at a higher rate of speed than is absolutely necessary. Speed not only means the greater wear of machinery and consumption of gasoline, but it means greatly increased tire wear as well.

In some instances it has been noticed that tires upon the right-hand side of automobiles wear out a little quicker than those on the left side. A gentleman who had observed this, and who was much puzzled to explain it, finally came to the conclusion that it was due to the increased weight put upon that side—the right—of each vehicle which traveled upon country roads which were kept in good condition. It appeared that the car, always keeping to the right, was constantly running with that side the lowest. Thus the center of gravity of the car was shifted accordingly, to the right, bringing more load upon the right-hand wheels. The gentleman referred to set about proving this matter to his own satisfaction by changing the tires from one side of the car to the other so that before they had made their allotted number of miles, each tire had seen equal service on both the "light" and the "heavy" side of the car. The gentleman further stated that the tire change noted resulted in an increased mileage from the tires, thereby proving his contention to be true. But in city used vehicles, it will do little good to try the reversal method as there is not as much gutter pitch to the city street as to the country pike, especially when the latter is well kept up and is crowned frequently. But as every little helps, the scheme is well worthy of a trial under one's own conditions.

Experientia Docet.

From R. Austin, California.—I will try and tell my experience with the proprietor of a local garage. The needle valve of my car leaked so that it ran out 11 gallons of gasoline some time during the week. I am a working man and can use the car on Sundays only. I took the machine to the garage and had the valves ground. The job was a good enough one but in putting it together he left the drain screw out in the bottom of the carburetor and then tried to make it run by changing the adjustment. After working four hours he told me to take the car home and he would come over the next Sunday and see what was the matter. I have not been able to get it to run right since. With a little more experience of that sort I shall begin to believe more than half the stories they tell of garages are true.

THE CARBURETOR.

The Effect of the Variation in the Pressure Upon the Flow of Gasoline.

BY SYDNEY F. WALKER.

One word more about the effect of what may be called a sticky or tenacious liquid, or a viscous liquid, before we leave it. Fig. 1 shows diagrammatically the difference between the flow of a viscous and a less viscous liquid. A viscous liquid is shown in the tube on the left, the particles being large and many of them, clinging to the tube; a less viscous liquid is shown at the right, the particles being very small and not adhering to the tube.

Yet another point in the carburation problem, and again a most important one, is the variation in the pressure which is driving the spirit out into the air current. The pressure is usually referred to as suction pressure; but it really means the difference between the atmospheric pressure on the outside, and the lowered pressure on the inside, due to the exhausting action of the engine on the suction stroke, and the inflector action. It will be remembered that at the commencement of the suction stroke, there is a certain quantity of air present in the space leading to the valve and in the clearance space in the engine. As the piston recedes, assuming that it is working gas tight, or nearly so, the space occupied by the air is increased, its volume therefore expands, the pressure which it has exerted decreases, and the pressure of the atmosphere on the outside, is able to force air through and across the carburetor nozzle, thus setting up the inflector action referred to in a previous article. One of the first points to be noted is, that as the piston moves outwards the suction increases, and therefore the pressure driving the air across the carburetor nozzle, is also variable and increasing. Again however, the rate at which the piston is moving is variable. At the commencement of the stroke it moves rather slowly, then during what is called the acceleration period, the speed is gradually increasing, and at an increasing rate; and during the latter portion of the stroke, negative acceleration is taking place, the speed at which the piston is moving is steadily decreasing, and the change is at a decreasing rate. All of this is reflected in the passage of the air through the carburetor chamber, and across the carburetor nozzle.

Some experiments were made a little while back in London, to determine the effect of the difference in pressure upon the rate of flow of different fuels through a given nozzle. As might have been expected, the effect was greatest with the heavier fuels, but it was distinctly marked in the lighter fuels. With kerosene, increasing the pressure from 1.2 inches water gauge to 2.4 inches nearly doubled the rate of flow; but with ordinary gasoline of the usual specific gravity, the rate of flow was only increased a little over 20 per cent. Still this is appreciable. During the experiments in question, measurements were also taken of the suction pressure in carburetors of particular patterns, at the air inlet to the carburetor, and at the inlet to the engine valve, at varying speeds of the engine. With the speed of the engine very low, as would be supposed, the suction at the carburetor inlet and at the air inlet above the carburetor, were both low; and they increased at a somewhat rapid rate, with the increased speed of the engine. Between what may be termed dead slow of the engine, and a speed of 1,000 revolutions per minute, the suction at the carburetor inlet increased in the rate of 7 to 1, while that

at the air inlet beyond the carburetor increased at rather faster rate. At 1,000 revolutions, the water gauge at the carburetor inlet was 1.6 inches, and at the air inlet beyond 5 or 6 inches, according to the inlet area available, the inlet area was varied. With another form of carburetor, specially designed to compensate for the increased proportion of gasoline vapor in the air, with increased speed of the engine, the water gauge at the carburetor air inlet increased over eight times, while the speed only increased three times, the water gauge in the chamber leading to the valve increasing ten times with the same variation in speed. At 1100 revolutions, with this carburetor, the suction at the carburetor air inlet was 1.8 inches

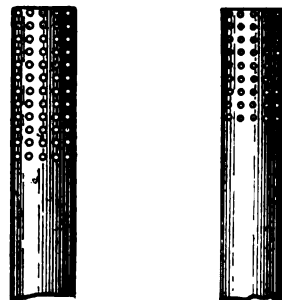


Fig. 1.

water gauge, and in the air inlet beyond the carburetor, 11.5 inches. The inch of water gauge it will be remembered, is employed to measure very small pressures, such as are used with air. It equals 0.55 oz. per square inch. Fig. 2 is a diagram showing a water gauge as used for small vessels and its application to the carburetor air inlet.

In the first article of this series, it was pointed out that the ability of the air to absorb gasoline vapor, depended upon the tension of the vapor coming away from the body of the gasoline, and upon the tension of that already present in the air that was taking up the vapor. The tension of the vapor coming away from the body of the gasoline varies with the temperature, as shown in the diagrams of the first article. It will be noticed that at a temperature of about 67

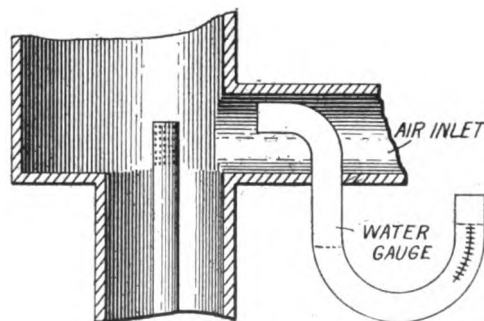


Fig. 2.

degrees F. the vapor tension is 120 m/m of mercury, which corresponds to about 2.32 lbs. per square inch. This is very much greater than any of the suction recorded in the experiments described; and it would therefore appear that the injector action mentioned in a previous article, will be the important agent in drawing up the gasoline out of the reservoir, and delivering it to the engine, together with the temperature at which the gasoline itself is maintained. Referring again to the diagram in the first article it will be seen that the tension of the vapor falls very rapidly, as the temperature of the gasoline falls, and it is still falling as the temperature of the gasoline also decreases.

Some measurements were taken also of the velocity of the air passing into the carburetor, and moving past the carburetor jet at various speeds of the engine, in the same series of experiments referred to above. The velocity of the air at both the carburetor inlet and that passing across the carburetor jet, increased in about the same ratio as the engine speed. Evidently then the important points in connection with carburation, so far as the provision of a free flow is concerned are, the velocity of the current of air passing across the carburetor jet, and the temperature at which the carburetor itself is maintained, the latter being of very much greater importance than the former. Apparently any increase in the temperature of the gasoline rapidly increases its vapor tension, and its ability to come away freely. On the other hand, any increase in speed, increases the rate at which the air passes over the carburetor jet, and the rate at which the gasoline vapor is pulled out of the carburetor, and delivered to the engine. Bearing in mind that at the high speeds ruling with some modern engines, the cylinder only takes half its volume of vapor and air at each stroke, the increased velocity of the air causes an increased richness of charge, as motorists have experienced; but it should be possible to compensate for this, by decreasing the temperature of the carburetor itself, and therefore the arrangements that are made for increasing the temperature of the gasoline, would appear to be wrong. For high speeds apparently, low temperature would be best, providing that the action of the carburetor can be ensured continuously.

BUYING A CAR.

A Few Wise Points the Intending Purchaser Should Heed.

The purchase of an automobile is an important matter. It means quite a heavy expense, and if the transaction be not attended with a good deal of care it is liable to break the happiness of the purchaser as well as his pocket. It is one thing to wish to own the best car on the market, and it is quite a different thing to find, for a given sum of money, the car best adapted to the purchaser's particular use.

Let the other fellow try out all the new schemes and so-called improvements, which make such an excellent talking point for the salesman. Speculation may be legitimate sometimes, but it is rank folly on the part of the man who buys his first car. Let the other fellow—its manufacturer—do the experimenting.

Probably the most disinterested as well as the most competent advice in regard to a car, would be such as is obtained from a mechanical engineer. While it is courteous to give heed to the experience of friends who own and recommend some particular make of machine, it must be borne in mind that their judgment is likely to be influenced by their own somewhat one-sided experience. The automobile is wholly technical and mechanical and is usually sold to a non-technical man. This condition is often the reason for a demand that the car shall possess all the fads and fancies of the year's fashion, whether they have any real merit or not.

In purchasing a car, it is well to study the character of the manufacturers, and it is desirable to visit their factory. It must be borne in mind that it is quite likely that the purchaser may some time require some repair work done on his car or some new parts. Is the company you are considering well

enough organized so that they will give your order attention? Is it reliable enough to permanently manufacture standard and interchangeable parts, or will its cars vary with the whim of the proprietors and the carelessness of the workmen? Are the cones, shafts, rods, bolts, and details in general of all varieties and sizes, due to changing standards? Are the managing heads of the company technical men, engineers capable of designing and manufacturing a high-grade machine? Owing to the great demand for motor-cars, there has been a rush into the business of those who are in no way qualified to build a high-grade car or to take care of repairs or orders for replacements.

Many are admirably qualified to build simple machinery, but these same men are not necessarily by any means qualified to build motor-cars. The qualifications required for the conduct of high-class automobile manufacturing are of a special class.

A motor-car company recently hired a first-class designer for a short time to work up engine designs, and then let him go. As the fashion changed, larger cylinders were demanded. So the company had their drafting force, now without any competent designing head, put in the larger cylinders without making the proper alterations in design of bearings, shafts, and other parts. The result was that the season's output of engines simply went to pieces.

There is unquestionably a great market for fairly light cars to be run at moderate speeds and to be sold at prices between \$500 and \$1,500. A person needs to be particularly careful in selecting a car which is sold within this range of prices, especially of the company is a new one. In competition with such cars, it is worth while to consider a second-hand car of well-known high-grade make. In considering such a car, it is advisable to employ the services of an expert, or of an experienced driver or other thoroughly competent person who is as able to give advice on the merits of an automobile as is a piano expert or veterinarian in his own special line. In considering a second-hand car as compared with a new car of cheaper make, it is advisable to look up second-hand cars of the same general type and the same horse-power as the new car. If a second-hand car of higher horse-power is purchased, it will cost more to maintain than the new car of smaller horse-power. It will consume more gasoline, and the work on the tires and consequent wear will be heavier. It must be borne in mind that the cost of operation and repairs is a higher percentage of first cost in high-power than in low-power cars. With a high-power fast car, the temptation is to drive hard, and thus run up the cost of fuel and tires.

In considering first cost and cost of maintenance of an automobile, it should be borne in mind that it is practically horses and carriage combined. Its first cost may well be as high as that of an extra high-grade horse, harness, and carriage. Its stable bill of the car is little. The gasoline and most other bills depend upon the mileage.

The largest item of expense is the tire bill. When we speak of tires, we naturally think only of pneumatic tires. Not sufficient attention has been given to the use of solid tires which will answer only where the roads are smooth. Pneumatic tires are undoubtedly the most comfortable, but they are also the most costly.

The following rules should be observed in buying a second-hand car:

Give little attention to paint, varnish, or upholstery.

tery. Insist on a day's trial on hills and rough roads. Inspect the engine, and examine condition of cylinders and bearings. If the bearings are scored or the cylinders manifest any crack when a candle or incandescent light is put inside the cylinder in the dark, the car should not be bought.

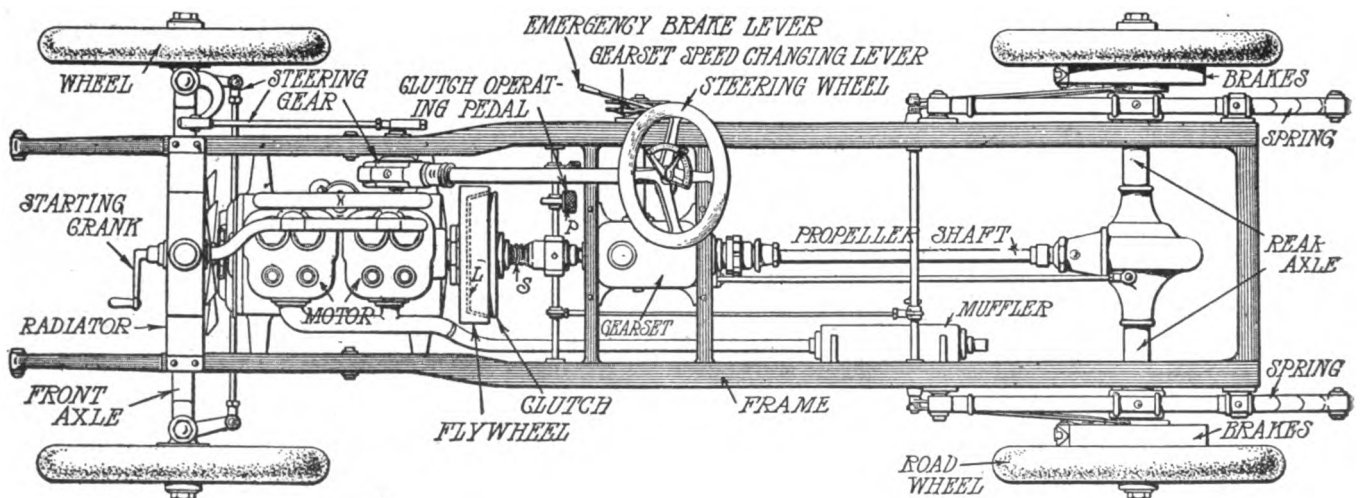
See that the axles are straight, and that all wheels run true and parallel.

Find the number and type of the engine as marked on it somewhere, and write to the manufacturers of the engine for the date of manufacture. Many automobile manufacturers have the engines built at other shops, and the name of the manufacturer of the engine needs to be secured.

In the case of an electric car, have the batteries discharged through a recording voltmeter and ammeter; and see that the amperage of discharge is equal to the force required to run the car on a level road. See that the motor is in good condition and shows no evidence of overheated insulation.

In investigating the merits of cars, one should not lay too much stress on a single demonstration. The

gravity of the car as near the ground as possible, with, however, plenty of clearance below the front and rear axles. Large wheels permit of this clearance and give easier riding, as they do not go into small ruts or bumps. A low center of gravity gives less bounding and less danger of turning the car over. With a low car, large wheels must be used. Rear trucks should be located well back, as in this position easier riding is secured. Long springs are conducive to easy riding. Springs built of leaves not less than $1\frac{1}{4}$ inches wide and $\frac{1}{8}$ inch thick have been found to wear better than those narrower and thicker. The easy-riding qualities of a spring depend on its resilience and its ability to absorb shocks without undue recoil. This action is facilitated by the use of a long spring. In this respect the three-quarter elliptic is better than the half or full elliptic. Various types of shock absorbers have also been used with success to lessen the recoil action of springs. It is claimed in behalf of the three-quarter elliptic, that it acts as a shock absorber. The three-quarter elliptic is simply a half elliptic with a quarter elliptic sup-



Sketch of the common form of automobile chassis, with designation of parts.

conditions on the occasion of that demonstration may have been exceptionally good or exceptionally bad. Try it under varying conditions. Into whichever classification the car may come for use and speed, it is always the wise course to demand of it just a little less than its limit of capacity. The cheaper the car, the more important is this caution. In watching a demonstration, one should note particularly whether there is difficulty, delay, or noise in changing gears, in braking, overheating, or trouble in starting.

Formerly a car was considered as being powerful enough if it had one horse-power to 100 pounds weight. The reason for this is that it eliminates the necessity of a change in gears, permitting running on the high gear practically all the time, even when hill climbing. But continued running at high speed means the wearing-out of the different parts. The slower the engine is run without straining it, the longer it will last. High speed and great weight always mean a great amount of wear and tear. The power developed by gasoline motors or engines several years ago was not much more than one-half, for a given diameter of cylinder and stroke, of what it is to-day. A few years ago a good water-cooled motor averaged from 13 to 15 pounds weight of engine to the horse-power. This figure has been reduced to as low as 10 pounds of motor weight to the horse-power.

A great aid to easy riding is to have the center of

porting one end of it; or it might also be defined as a full-elliptic with one upper quarter cut away.

The parts of a car liable to require adjustment at any time should be easy of access, without the need of dismantling or partially dismantling the car. Among the parts which should be easy of access, are: Engine inlet and exhaust valves; commutators; pumps (oil and water); clutches; clutch springs; gears; brakes; throttle and spark rods. Of late years considerable attention has been paid by most makers to securing accessibility of engine parts; but the same is not true of the rest of the mechanism. In the case of the engine as a whole, it is easier to lift off a hood than to lift out the floor. At the same time, in the case of clutch and clutch springs, it is easier to lift out the floor than to have to take off the whole body. Almost all vehicles are built so that the floor can be taken out; but in many the design is such that after that is done the parts are not sufficiently accessible.

A Word to the Chauffeur.

If you would succeed as a chauffeur you must have in addition to a knowledge of the car and how to run it, good eyesight, good hearing, good health, courtesy, and you must keep clean and tidy. In seeking employment it is not essential to apply in full driving rig; indeed, it is better not to do so. The ideas of employers as to the get-up of their chauffeurs vary

considerably, and if the applicant presents himself quietly dressed in ordinary attire with clean collar and shoes well blackened, it is easy for the employer to formulate an idea as to the probable suitability of the applicant if dressed according to their pet theory of what an ideal attire should be.

IMPORTANCE OF GOOD MATERIAL

Purchasers Should Fully Inform Themselves as to What the Car is Made of.

Those who have occasion to visit garages and repair shops have often been little less than astounded to note the quality of material that is exposed by some of the broken parts sent for replacement or repair. In too many instances the iron and steel are of inferior rather than superior quality, and this is especially the case where the part is not expected to endure much wear or strain.

There is simply no excuse for this whatever. The cost of a finished automobile does not lie in the material with which it is constructed, but in the labor performed in putting that material in shape for such construction and in the finish, the assembling of the parts and the cost of marketing.

Intending purchasers should insist on the best material in any event, and upon such finish and workmanship as they can afford to pay for. Ordinary or poor material will not produce a satisfactory or durable car, no matter how fine the finish or how much it may be "built like a watch."

Of course, there are many things which go into the cost of the automobile, but the labor is the most expensive of all, and after that the cost of selling—the advertising, transportation to the market, agent's commission, etc. In some cases the cost of advertising is borne by the factory; in others by agents. When a car is sold through an agent he naturally has to make his profit. His share of the returns from each car has to pay for the rental of his place, the hire of his men and in some cases the advertising, all of which has to be rated against the cost of each car to the consumer.

Raw material for automobiles made with care cost more now than it used to, but more important is the increasingly greater cost of labor. When material is worked through many processes and inspected after each this means a great deal of expense. Mechanics are paid, some by the hour, some by the piece, but they must be well paid.

If efforts are made to get the parts used down to close fits, time is expended. In the case of makers who assemble but do not make their cars these costs are reduced. When automobile parts are produced in great numbers it is possible to bring down the charges, especially if some of the refining processes are eliminated. The wear on tools and machines is all the greater when it comes to handling the superior materials and when these give out after a brief time they all have to be replaced.

In addition to this, the general supervision of manufactures and sales are entrusted to a large squad of men, some of whom get very large salaries. They handle the finished product and put it on the market.

If an automobile company makes its own bodies and finishes them there is an element of added cost in the way these things are done. If the bodies are actually painted and repainted, making twenty coats or more of paint and varnish put on, that takes time and expense. It adds to the endurance of the appear-

ance of the car, but not to the endurance of the car itself. When bodies and wheels are painted by dipping and then wiping off the surplus they don't come so high. When they are made of wood they aren't so expensive. And still further, when they are bought from makers of bodies they cost still less, especially when that is done in quantity.

When they are sent from the factory, to be handled by an agent, the factory is through with them, although if the manufacturer look after the welfare of owners there is likely to be future expense. If an automobile is well made the expense account should be small. If a man has had a car of a certain make for a number of years and toward the end of its career it begins to need replacements, he is entitled to find parts without much trouble at the factory. Keeping these in stock and looking them over frequently to see that they are fit and proper is another element of expense, although most makers get good profits on such replacements.

When an automobile is road tested, that amounts to something in money. If a car is delivered to a dealer in such shape that he has practically to reassemble it, the cost is something, but in the end the consumer pays.

A dealer who is paying big money for the agency he occupies and who has a large corps of salesmen has further items of expense that are to be considered. He buys from the factory at certain figures and he has to consider how he can make a profit and still sell at list prices.

The most expensive cars do not always represent the greatest percentage of profit. If a factory figures to make 20 per cent. disposing of its entire output to dealers, and the dealer figures to make 15, this makes quite an addition to the cost of the car, but it is less than the average profit.

If 30 per cent. of a thing is estimated profit to be split among two parties, the factory and the dealer, that does not after all seem so great.

It must not be inferred that this is what each one always makes on the car. That is to say, a dealer may get \$1,000 or so on a car that costs \$5,000 or \$6,000 to the consumer, but when his expenses are paid he isn't likely to have more than half of it. At first blush to make \$1,000 on, say, thirty cars sold in a year seems a lot. But out of that \$30,000 must come a great many items, and probably the agent doesn't clear, when the year is over, more than a third of that.

The idea currently existed once that the automobile business was one of unlimited profits, but the average manufacturer nowadays isn't looking for get rich quick propositions. He has settled down to strict business lines and he doesn't expect and has no reason to expect outrageously large dividends.

But the fact that it costs a good deal to market a car should make it all the more imperative for the purchaser to know that the materials with which it is constructed are of the very best, for the difference in cost of ordinary material and the best material added to the sales price would be a very small per cent. indeed of the total.

It is a pretty well established fact that since it costs no more to make a suit of clothes of the best material than it does to make one of poor material, the best goods are the cheapest in the end. But if this be true in the matter of wearing apparel it is just as true and far more important in the case of an automobile where not only the cost and length of service is far greater, but where the safety of the occupants depends upon honest and high grade material.

FAVORS THE LONG STROKE.

A Well-Known Engineer Gives the Results of His Experience and Explains His Theory.

In a paper read before the New York Society of Automobiles, Edward A. Myers, a well-known authority said:

Fifteen years ago we designed and built our first line of single cylinder stationary engines, which we would now call medium-short-stroke engines. They were built in the following sizes: (In order to avoid repetition of the words "bore" and "stroke," we give the cylinder diameter first; stroke second). 5x6, 6x7½, 7¾x10, 7x9, 8x12, 8¾x12, 9 1-8x14, 10x15, 11x15, 12½x18, 15x22, 17x26.

After building these sizes for four or five years, we then conducted a series of tests with motors of various bore and stroke, which resulted in our bringing out long-stroke single-cylinder engines in the following sizes: 4½x7, 5x8, 6x9, 7x11, 7¾x12, 8x14, 8¾x15, 10x18, 11½x18, 13x20, 13x22, 15½x26, 17x30.

Eight years ago we spent some time with the double-opposed motor, building it in three sizes, as follows: 4½x7, 5x5 and 5x7.

Seven years ago we commenced work on the four-cylinder engine and have now built this in the following sizes: 3½x4½, 4x5, 4¾x5, 4¾x5½, 4½x5½, 4½x6, 5x5, 5x5½, 5x6, 5½x6, 6x6, 6½x8, 7x10, 7¾x10, 8x14, 9x16, 10x18, 11x18, 13x24, 16½x26.

Of the four-cylinder motors we have been using all sizes up to and including the 8x14 for pleasure vehicles, commercial vehicles and tractor work in general, including considerable railway locomotive work.

After looking over the table of cylinder dimensions we have given, you will no doubt agree that we are distinctively advocates of the high rate of compression and expansion, which we believe is best secured in the long-stroke motor.

In one of the earlier types there will be noticed a single-cylinder engine, 11x15. This engine was rated at 20 H. P. at 220 r.p.m. and at a piston speed of 550 feet. About 22 H. P. was all that could be got out of it, and the rate of fuel consumption was high—about one and a fifth pints per horsepower per hour. You who have followed the progress made in internal combustion engines for the past few years will readily agree that the piston speed of this engine is enough to condemn it; but let us call your attention to the fact that fifteen years ago that piston speed was considered extremely good practice, and even today some of the best engineers in the employ of the government are sending out specimens for bids on internal combustion engines wherein they specify that the piston speed must not exceed 850 feet per minute.

We fear that too many of us rely on our knowledge of the steam engine and are wont to confuse it with the internal combustion engine. It must be remembered that in the latter the piston does not receive its impulse from the pressure of a slowly expanding gas similar to that of the steam engine, but from a pressure developed instantaneously, causing a shock to be applied to the piston, the force of which must necessarily be in proportion to the compression used and the area of the cylinder.

For the purpose of comparing the work of the short-stroke motor with the work of the long-stroke motor, we call your attention to the table of the long-stroke motors we have given. You will notice in this table a 10x18. This engine was designed to take the place of the 11x15 of the earlier type. It weighed

about 1,500 pounds less, and was built for 25 H. P. at a speed of 265 r.p.m., or a piston speed of 795 feet per minute. Thorough test showed this engine would develop 40 H. P. on a smaller consumption of fuel than that on which the 11x15 would develop 22 H. P. Also that the efficiency of this engine continued to increase as the piston speed increased up to 850 r.p.m., at which speed it proved to develop a horsepower on the least amount of fuel. It is interesting to note that when the bore of the cylinder was reduced, the crankshaft, and all other parts were correspondingly reduced in size, with a decrease in weight of about 1,500 pounds. After ten years' service under all conditions it has shown clearly that it is much more durable and costs less for repairs than the shorter stroke engine.

We might go through the entire list and make a comparison of what was accomplished with the long and short-stroke motors, but it is enough to state here that the results were all in line with the case we have just cited.

It was shown that the piston speed must be much higher in some engines than in others in order to get the best results, showing conclusively that trying to hold to a given piston speed regardless of whether or not engine is of short or long stroke, large or small bore, is all wrong.

Briefly, I would say that the advantages of a long-stroke motor over a short-stroke are:

1st. A motor much lighter in weight for a given horsepower.

2d. A motor of longer life.

3d. A motor more economical in the use of fuel.

4th. A motor requiring less radiating surface for cooling.

5th. A motor of smoother running qualities and less noise.

It seems to be the prevailing opinion that the longer stroke motor is of heavier design. Our entire experience has been exactly the opposite. For an illustration, take a 4x4 motor of modern construction. It is a bad design, indeed, if any good designer cannot copy it, changing it to a 4x5½, making a motor of as long life at an increased weight of from 5 to 10 per cent. In making the change he will get an increase in power of from 25 to 35 per cent. at the same number of revolutions per minute. He will not have increased the initial pressure on the piston head, the shock caused by the instantaneous expansion of the gases at the beginning of the stroke, or the pressure on the bearings. Hence there is no occasion for increasing the thickness of the piston head, cylinder walls or other parts.

The advocate of the short-stroke motor will at once reply that he will simply increase the speed of the motor until he gets the same piston speed and will then get the same power. At first glance it seems that he is right from a theoretical standpoint. But such is not the case. Neither is he correct from a practical standpoint. In the first place, the greater the speed of the motor, the more the power required to propel the motor itself. We must not lose sight of the indicated and actual horsepower and the fact that the power required to drive the motor itself must be considered as lost. It should be quite clear that it will require more power to turn the 4x4 motor a greater number of revolutions per minute to get the same piston speed as the 4x5½. Hence if there were no other advantages, this increased frictional loss would prevent the securing of the same power from the shorter stroke motor.

There is a speed at which every motor will produce

the most power for the amount of fuel consumed. It will be found that the actual pull in pounds will increase with the speed of the motor up to a given point, when the pull in pounds will begin to decrease. If the speed is increased beyond this point the motor will continue to develop more power, but not in proportion to the increase in speed; hence, at a greater fuel consumption.

On the other hand, below the speed at which the pull in pounds is greatest, the horsepower is not only less, but the fuel consumption is greater per horsepower developed.

If you test this out fully you will find that the highest point of efficiency is at a higher piston speed on a long-stroke than on a short-stroke motor.

Another reason why you cannot get the same power from a shorter stroke motor by increasing it to the same piston speed as the longer stroke, is because of the impossibility of converting into work the same amount of heat from a given number of heat units. Of this advantage we shall speak later under another head.

The long-stroke motor of a given horsepower has a smaller cylinder diameter, and, as the initial pressure on the piston head is practically the same in both long or short-stroke construction, if there is no difference in the diameter of the cylinders, it is clear that the actual pressure on the piston head in the motor of smaller diameter and longer stroke will be less than in that of larger diameter and shorter stroke, and as a natural result the shock caused by the quick expansion of the gases at the beginning of the stroke is less in the smaller diameter; the work on the bearings being not so severe. In the short-stroke motor, practically all parts, with the exception of the piston, must move faster. This, together with the number of reversals of direction of motion per unit of time, must necessarily mean more wear on bearings, valves, valve-stems and cams.

It is well understood that the intake valve does not require the attention of regrinding the exhaust valve does; the heat of the escaping gases being responsible for the difference. If we can reduce the temperature of the burnt gases as they are permitted to escape through the exhaust valve (which is accomplished with the long-stroke motor), we thereby reduce the cause for regrinding to that extent.

From a given quantity of fuel we get so many heat units, the distribution of which we might divide under the following heads:

- A. Frictional losses.
- B. Loss by reason of heat carried off through the cylinder walls.
- C. Loss through exhaust.
- D. Amount converted into power.

In the discussion of this subject of economy in operation we shall consider separately each head under the disposition of heat in the order given.

- A. Frictional losses.

If we are correct as to frictional loss above mentioned, this alone would make the long-stroke motor more economical, were there no other losses.

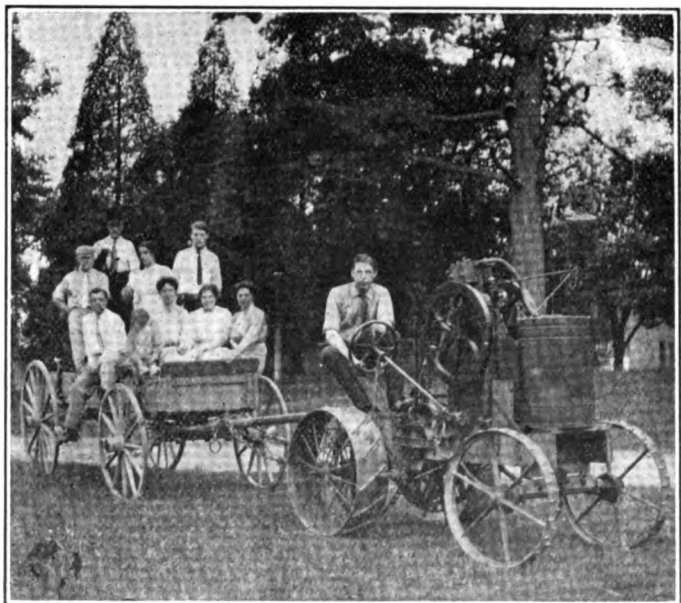
- B. Loss by reason of heat carried off through cylinder walls.

It has been stated frequently by very able men that the loss through radiation or through the cylinder walls of a short-stroke motor was less than in the long-stroke motor and that for this reason the former was more economical of fuel. In this opinion we can in no way concur.

This argument is based upon the theory that the

stroke being longer, more of the cylinder wall is exposed, and as a result there is more chance for the heat to be carried off through that part of the cylinder swept by the piston. If this were true, the loss would still be less than on the short-stroke motor with the larger bore, for the reason that the compression chamber on the larger bore leaves a greater exposure of wall surface. Again, this greater wall exposure in the compression chamber occurs when the compression is at the highest possible point; while with the long-stroke motor that part of the cylinder wall swept by the piston by reason of the longer stroke, is not exposed until the pressure has reached the lowest possible point. Hence the loss would not be so great even with an increased wall exposure in the longer stroke.

In order that we may properly understand this, we must get some idea of the capacity of the cylinder walls for absorbing and carrying off heat. Let us assume that we have a proper mixture of gas and air confined in the compression chamber of the cylinder of a properly constructed motor, with all valves closed, no leaks of any kind, piston immovable, compression 60 to 70 pounds, and the charge ignited. Under these conditions it will be seen that no heat can be converted into work, no frictional loss and no loss by means of exhaust; in fact no escape except through the cylinder walls. Let us further assume that when this charge is ignited, it will immediately expand and create a pressure within compression chamber of from 300 to 350 pounds per square inch. If we were to ask the man who had not given this matter careful thought, or who had made no practical test of it, how long it would take under such conditions for a sufficient amount of this heat to be carried off through the cylinder walls to reduce the pressure within to 100 pounds, he would more than likely say from five to ten minutes. If we were to tell him that as a matter of fact it will take less than two seconds, he would either not believe it or would at once begin to realize what high piston speed means when it comes to a question of economy. It is thus seen that when we increase the piston speed, there is less time for the heat to be carried off through the cylinder wall, and as a result more of it is converted into work. When this is done by means of increasing the stroke,



A ten passenger touring car that never exceeds the speed limits.

there is but little frictional increase, and a clear gain in power, with less fuel consumption.

It has also been demonstrated that with the longer stroke the compression can be increased over that of the short-stroke motor, without any of the bad effects or disadvantages of too high compression. Increased compression is another step toward more economical operation.

It is evident that the further you expand the gases, the less heat will be carried off through the exhaust. Observation of the exhaust alone from a long and short-stroke motor, both properly constructed, should be sufficient to satisfy the mind that the exhaust gases can be permitted to escape under a lower pressure with the long-stroke motor; a properly taken indicator card will show this clearly.

The advantages here are covered almost completely by the remarks as to loss from radiation through the cylinder walls. If we have less loss through the cylinder walls, we require correspondingly less cooling surface, which means a saving in expense as well as a reduction in weight.

Smoother running qualities and less noise are secured in the long-stroke motor because of the fact that the initial impulse is much less. The pressure on the piston head is the same whether the motor has a 4-in. stroke or 6-in. stroke, if the diameter and compression in both are the same. If we must use the larger bore, in order to secure the same power, we must expect the natural results of a larger motor, or of a larger cylinder diameter with the same stroke. The noise must necessarily be increased when motor is running at a greater number of revolutions, because of the increased speed of opening and closing valves, and the movement of the other parts of the motor.

Again, it is a well-known fact that with the long-stroke motor you secure better mixing and vaporizing of the charge. You can throttle the motor down lower so that it will pull much more steadily, quietly and smoothly on hills or on slow speed under heavy load. It is not difficult to see that the further the gases are expanded, the less noise will be created by the escape of the exhaust gases; likewise, that exhaust valves will open against less pressure.

Many other reasons might be advanced in favor of the long stroke. We have tried to touch upon what we consider the most important. We have not gone into the question of what we consider the best proportion of the stroke to the bore, for the simple reason that so much depends on the work for which the motor is to be used. What may be ideal in one case may be all wrong in another. Where you have a given number of revolutions per minute, as in stationary work, the better practice is to use the longest stroke possible, consistent with a smooth running engine. Where you must have variable speed, the better practice, in our opinion, is to have the stroke such that the piston speed will be at a point showing the greatest efficiency at the number of revolutions per minute at which the motor will be more generally used.

Generally speaking, for motors used for work requiring a variable speed, the smaller the motor the greater the stroke can be in proportion to the bore.

Carrying the long stroke to the extreme or to the point of what we sometimes call freak construction will only do injury to its progress, but we have had this in every idea since the creation of man and must expect to see it carried to a point where stroke is out of all proportion to the bore from the standpoint of good construction.

In speaking of the proper proportion of the bore to the stroke, depending on the work of the motor, we desire to make it clear that we believe the advantages of the long-stroke motor are much more essential to the construction of good commercial vehicles than pleasure vehicles, because of the wide speed variation. With the truck or commercial vehicle the conditions are different from those of the pleasure vehicle. The governor is now being used extensively on the former for limiting the speed, and a fourth speed is being used in the transmission for increasing the speeding of the car when running light. Hence the motor can be operated more nearly at the piston speed at which it will give the most economical results.

Regardless of how far we may go in the future in the increase of the stroke of motors used for pleasure vehicles, we are firmly convinced that the motor with the bore equal or nearly equal to the stroke will very soon be a thing of the past for the truck or commercial car.

Take, for illustration, the 4x4 motor to which we have formerly referred. In order to get the best results from a standpoint of fuel consumption per horsepower developed, it would be necessary to run it at a speed of something like 1,400 to 1,500 r.p.m. It would be far better practice to increase the stroke so that the desired piston speed could be obtained at something like 1,000 r.p.m., and by so doing not only be operating a greater part of the time at the nearest point to the speed where the most power will be produced for the amount of fuel consumed, but with the further assurance that you will have less wear and tear on the motor, giving much longer life.

It is difficult to pick up a present-day trade journal commenting on the long-stroke of European motors, which does not attribute the development of the long-stroke motor on the Continent to the tax conditions. We agree that the tax question may have had something to do with the hastening of its development.

GENERAL RULES.

A Few Points Concerning Care and Driving that Will Apply to All Cars.

Although even manufacturers make mistakes it is better to follow their instructions in running your car than to take the advice of some one who, although having far more general knowledge, is not so familiar with any one particular car as he who planned and built it, has experimented for months with it, and is more interested than anyone else in its success.

But there are certain directions which are general and apply to any car, and these may be repeated occasionally:

Thoroughly lubricate every moving part where friction occurs. This not only includes the swiftly moving parts but also parts having a very limited movement, such as the ends of the springs on the spring bolts, etc. Always have plenty of oil in the lubricator; see that it feeds properly, and is of the grade specified. A little oil in the right place at the right time will forestall a big repair bill.

The brakes should always be properly adjusted, and the operating mechanism well lubricated. Care should be taken to install new linings before the original ones are completely gone.

The steering gear should be frequently examined to see that the lost motion is taken up, and to make sure that no pins, bolts, or nuts have worked loose.

The compression in all cylinders must be uniform.

This can be very closely gauged by pulling the starting crank over at an equal rate of speed for all the cylinders. If the compression is not up to the standard, as a result of leaky valves, scored cylinders, worn or damaged piston rings, etc., the horsepower of the motor will be materially reduced, and a general loss of power will result. The matter of compression and the causes for it are usually overlooked, and carburetor adjustments and ignition system variations are resorted to when oftentimes these parts are not responsible for the trouble.

Gasoline should be strained through a chamois when filling the tank. There is nothing more exasperating than dirt or water in the fuel system. Considering that the opening of the needle when set for normal running is only a few hundredths of an inch, it is seen that a very small amount of dirt will stop up this passage and cause trouble.

When washing the car, do not use a soap which is made of an animal fat, since there are usually some free acids which act to destroy the finish. A pure linseed oil soap is the ideal one to use.

Raise the top occasionally, since if it is left in a folded position for a long time, it will become creased or cracked, and will also get full of dust and make a poor appearance when raised.

Look over the tires frequently; see that soapstone is put in the outer casing before putting in a new inner tube, and have patches on leaking tubes, as well as cuts in the casing tread, properly vulcanized.

Keep the car and its component parts clean. Sand and oil form a compound which causes undue wear when it works into the machinery.

Operate the car in a way which is conservative and economical. Considering the automobile as an investment, the degree of value received will in nearly every instance be directly in proportion to the judgment used in caring for and operating it.

The car should not be taken out until the matter of gas supply, filled and well-trimmed lamps, water in the radiator, and lubrication are all looked into.

The tires should be examined to see that no tacks, nails, pieces of wire or other undesirable materials are attached thereto, the extra tire in position, an inner tube is aboard to meet the case of tire trouble, and the tire pump is in good working condition and in place; the storage battery must be properly charged, the car has been properly cleaned and polished, and any slight adjustments to machinery or brakes have been made, loose wire connections and loose bolts and nuts have been taken care of. It is bad practice to allow the motor to run when not in use. Stop the motor and start it when ready to go, thereby saving the gasoline and oil, besides unnecessary wear.

All driving should be done at a speed with respect to road conditions and the speed ordinances and laws, and a good driver will never exceed the speed limit. The driver should watch the road and slow up for bumps and horses. If horses show skittishness, stop. In passing such horses the motor should be throttled down.

Mufflers should not be cut out in places where it will annoy people. Drive to miss sticks, stones, bricks and other obstructions that are liable to damage the tires. Driving in street car tracks is bad practice, as fine particles of steel are apt to injure the tires. Rubbish raked up in piles from yards should be avoided—it is apt to contain tacks.

In passing others, observe the rules of the road. Never cut in close ahead of another car. If you have an exceptional hill climber, the other fellow may also.

Cost of Upkeep.

A Houston, Texas, gentleman, when purchasing a touring car recently, started to keep an accurate account of its upkeep and here is his statement of operation and maintenance on a basis of the first 5,000 miles run:

Interest on investment of \$2,000 for six months at 7 per cent. per annum, \$70; cost of gasoline, 413 gallons at 16 cents, \$66.08; lubricating oil, 10 gallons zero-line at 63 cents, \$6.30; transmission grease, \$2; recharging storage batteries, \$2; recharging prestolite tank, \$12; original cost of four tires, 34x3½-inch, \$120. Although these figures are computed on a 5,000 mile basis, 6,000 miles have been secured from tires at present writing, and they appear to be good for 2,000 miles additional, a total of 8,000 miles. Accordingly, the tires having stood 5,000 miles of the 8,000 expected, five-eighths of their original cost should be charged off, \$75. Total, \$233.38.

Cost per mile: Tires, \$0.015; gasoline, .013; lubrication, .0016; charging (including batteries and presto tank), .0028; miscellaneous (including interest on investment), .014. Total operating and maintenance cost per mile, \$0.0464.

The two tires on the left-hand side of the machine have the same air in them that came with the tire. New air has been added from time to time, but there never has been a puncture or blowout on either. This mileage was not by any means all made on hard surface pavement in the city, as the car was used in railroad construction work, where it was frequently the case that it went through fields and made its own roads.

"When I say there were no repairs on the car," says the owner, "I do not mean that the car did not have attention. There are no garage charges in this statement, as the car was kept at my home and received my personal attention, but no repair parts were purchased and no repairs had to be made other than cleaning spark plugs and running kerosene through the carburetor once every two weeks, allowing it to stand over night, to get the carbon out of the cylinders, oiling and lubricating, which, of course, I did myself, as any driver of an automobile will do."

Pneumatic Starting Device.

It is comparatively easy to crank a car with small cylinder bore and stroke, but some muscle is required—to say nothing of experience and skill—to turn over a motor of 50 horsepower or more, and it is rather beyond the strength of the average woman to start a big car by cranking. In the case of many cars it is necessary to crank them only at the beginning of the day, starting the motor thereafter with the spark—if the compression holds.

However, it is not always certain that this can be done, and to obviate any chance and make the starting of the car no greater effort than the pressing of a button, the makers of the valveless Amplex are equipping their cars this year with a pneumatic starting device.

A button is located on the dash of the car, and its operation sends compressed air into the cylinders, starting the engine before an explosion of gas occurs. It is the claim that starting on the spark subjects the motor to a tremendous strain because that only cylinder gets the initial explosion, while with this self-starter, the crankshaft is revolving when the gas ignites.

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Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

LIGHT CONSTRUCTION.

In relation to the undoubted advantages of light weight cars which are made the subject of a communication on another page, it should be further stated, in order that the whole subject may be fully covered, that lightness at the expense of strength is a fatal defect. Moreover, the comfort and ease of riding in a heavy and substantial car compared with riding in a light car is rather more evident than might be supposed.

Admitting all that has been or may be said in favor of light construction, the danger of distorting the frame by use on the average rough road is something that should not be overlooked. It is generally admitted some of the wear to the engine and gear box is due to the fact that they are not wholly protected from the distortion of the frame. When a car is passing over an ordinary road its frame is in constant motion. It is not only bouncing up and down, but its parts are relatively in motion. The frame parts are bending more or less, and are constantly out of tune in relation to each other. If it were possible to take a record it would be found that only for very brief periods would the four corners of the chassis be absolutely in the same plane. If one wheel of a car be jacked up only sufficiently to lift the load off the tire it will be found that the whole frame is out of alignment. When it is borne in mind that on the road it is subjected to much rougher and more sudden distortions than this, it will be seen at once that the frame is constantly moving. Of course this is no fault. But it should be strong enough so that its distortions are not permanent, and consequently of the best material. Yet if the engine and the gear box be rigidly bolted to this springing frame they in their turn must suffer distortion. With them it becomes a very serious matter, as

their bearings are thrown out of alignment, and the result is internal friction, which in its turn means rapid wear.

Most of us remember the demand for light bicycles some years ago. It was learned from actual riding, however, that lightness at the expense of a certain amount of rigidity caused a twist and a binding of the bearings that caused lost power and hard propelling. In some automobiles the bearings are so good that the internal friction should be very small, and yet it is proved by performance that the engine is wasting a good deal of power. The usual tendency is to blame the engine, and to say it is not developing its full power. As a matter of fact, it may be simply wasting its energy in grinding away its own bearings and those of the gear box simply because it and the gear box are subjected to distortion owing to the distortion of the frame to which they are rigidly bolted.

Finally it should be stated that after having had some familiarity with repair shops one is inclined to marvel at the ordinary metal material that is often used in construction. Light cars must be made of the best material or they will be found inferior to heavy ones.

SPEED AND ROAD DESTRUCTION.

Whether or not an automobile is an injury or a benefit to the highway depends entirely upon how it is used. Driven at a slow speed it is an actual benefit to the roads on which it travels; driven at moderate speed it injures them less than the horse and carriage; driven at rapid speed it tears up the roads badly, the damage increasing in about the proportion of the square of the increased speed.

This will be readily admitted by those who have looked into the matter and observed the effect. Yet admitting this, it is impossible to fix the responsibility for the damage equitably. Nothing can be done and nothing said except that a good deal of the rapid speed is entirely unnecessary. There are cases, of course, where getting to the place of destination quickly is imperative, as in the case of physicians visiting patients, yet physicians are as a rule the most careful and considerate drivers. Nor are the reckless drivers business men, as a rule.

The reckless speed maniacs are mostly the leisure class—those to whom time is not much and who lead the "dolce far niente" life. They are not especially strong in numbers, but they are responsible for a large proportion of the automobile accidents and for a good deal of the speed damage to the highways.

There is no special remedy for this condition, yet it is well enough to recognize it, and possibly when the fact or the truth becomes well defined, reckless speed may not be quite so common and be far more unpopular.

THE POINT WAS TOO FINE.

A bright English woman said recently in this country that although the American people are rightly entitled to their reputation as being quick to appreciate a joke and the English to being slow of comprehension, yet her own people had a finer appreciation of genuine humor than the natives of this country. Possibly we may as well admit the charge. We have never produced anything quite so delightful as the whimsical humor of the comic operas that have come to us from the other side, as for instance those of Gilbert & Sullivan, and our best humorists hardly come up to theirs. As bearing out this view, a recent communication in

that able exponent of cynical humor, the New York Sun, may be quoted:

To the Editor of The Sun—Sir: That men buy and use automobiles is an indication that they are in a hurry in prosecuting their business or pleasure. As one of them I am frequently provoked that pedestrians are not in full recognition and sympathy with the speed. The horn on my machine is particularly loud and startling in tone, and if those walking are in abstracted moods, deaf or infirm, I cannot accept the responsibility.

In turning a corner recently it seems that the machine upset an elderly man, but as I was in a hurry I did not stop to learn if he was injured. Some busybody furnished my number to the officer who was pursuing me, and I was duly summoned to court, where a fine of \$25 was imposed. I could not see that the man was injured beyond an excoriation of the knuckles and abrasion of the chin, although he may have also received a mild shock when falling. As I paid for new spectacles and hat to replace those destroyed, I could see no further grounds for the bitter complaint he made.

AUTOIST.

It will be readily seen that the foregoing bit of satire is somewhat obscure but hardly enough so to be beyond ordinarily acute mental vision. Yet it called out the following in the Sun a day or two later:

To the Editor of The Sun—Sir: A letter from an "Autoist" delightfully entitled "The God from the Car" caught my eye in this morning's Sun. I am busy, but I've got to express myself.

This is the limit. Would you kindly ask this man if he is Louis XIV.? Or possibly a reincarnation of Peter the Great? He is annoyed because an old man got in the way of his car. Had he lived in the days before the Terror he would have got out, lashed the aged one to the wheels of his car and driven on, enjoying his shrieks. But as it was he took out his annoyance in being suddenly in a desperate hurry and didn't stop.

Imagine the gross despotism of a city government which actually haled him before a court, extracted a fine and made him replace the old man's broken spectacles with new ones!

And again, imagine the type of mind and character which can thus gratuitously show itself up before an unsympathetic public!

Most of those who own automobiles are decent people. The others ought not to be allowed to own automobiles.

ROBERT S. STEPHENSON.

Hereafter, "Autoist" will not put quite such a fine point upon his irony. The two communications amusingly bear out the view of our English visitor.

A BUSINESS OPPORTUNITY.

Those of our readers who are looking for a new business—and this is the case with a good many of us—should consider the present and the certain future development of the commercial automobile.

Let any one get the agency for a line of good business cars and if he will but push their merits as they deserve to be pushed and as results will confirm, he can make some money within the next five years. He can safely stake his reputation on the utility of the car and upon its decided economy over horse-drawn vehicles.

Many of the pleasure car builders are now giving their attention to light delivery wagons, and there will soon be a wide-spread demand for them. The only bar to their immediate installation is the present investment in horses and business wagons or trucks. Few can afford to cast these one side for the little they will bring at a forced sale. The economical method is to install the horseless vehicles gradually, as the horse-drawn outfit becomes impaired from natural causes.

Don't wait for some one else to get in before you, but do not imagine that this transformation is coming with a bound, so to speak. It has begun rather slow and it will increase in force as time goes on, for the public still needs education by precept or instruction and argument as well as by example before the change can become universal. But every commercial car or

truck that is in use is a convincing illustration of its superiority over the horse. Moreover, where there is competition in prices in the case of any kind of vehicle delivery, the outcome can be settled in no other way than by the substitution of the horseless for the horse delivery service.

GIVE US A PARCEL POST.

A good many plain people who have neither the time nor the opportunity to investigate the matter are wondering why we don't have a parcel post. They know that no less than forty-three other nations have it, and that this nation has made agreements with these other nations to receive and deliver their parcels when addressed to any person in this country and to receive parcels for delivery abroad, and they naturally wonder why we cannot have the same low priced carrying service within the confines of our own country that is had in other countries. We are going to tell them why in as few words as possible.

At the outset, let us say it is not because it would injure the country merchant. That ancient argument can be disposed of in a word. If the country merchant is not serving his customers as well as they should be served by some other means, he has no reason for existing. Very many time-honored ways of doing things have had to give way to newer and more economical ways of doing them. Change is essential to progress. Yet the parcel post will not drive the country merchant out of existence any more than the typewriting machine drove the steel pen out of existence, or the steel railway drove the highway out of existence. Each will have their place in the distribution of goods and the country merchant will continue to occupy his place long after a parcel post has been established.

But whether it will or will not injure the country merchant—and it will not injure those who are now serving their customers properly—is not the reason why we have not yet got a parcel post after thirty years of knowing that we ought to have it.

The real reason is because the most burdensome monopoly this country has ever had is opposed to it. The express company interest has always had its emissaries in Congress for the purpose of throttling anything that might interfere with its domination, and incidentally it has been extremely liberal with franking privileges for our law makers and for the "moulders of public opinion." The emollient effect of a book of express franks or the privilege of sending one's express packages for nothing, on a conscience that might be otherwise disturbed by the rapacity of the express monopoly, is simply amazing.

Incidentally likewise, it may be remarked that public service monopolies should be allowed to make a fair—and even a liberal—return on the cost of their service, but not on the value of that service. The express monopoly found no difficulty in splitting up for two of its branches within the past three years, the sum of \$48,000,000, which is about equal to the value of its entire stock, and this is an enormous return for the value of the service and simply public robbery for its cost.

But the country needs a genuine parcel post and not the miserable substitute recommended by Postmaster General Hitchcock. It should not be based upon a certain price for all parts of the country, but upon a graduated scale of prices fixed by distance zones. Otherwise the express monopoly will capture all the short and profitable haul business—all the cream, so to speak—and leave the long hauls and the unprofitable business for the United States government.

Uncle Sam has all the machinery necessary for handling packages—the buildings, the carriers, the cars, the

men—and the rural mail carriers who now average 25 pounds to the load might easily carry 1000 pounds if called upon. The German parcel post will accept packages up to a weight of 110 pounds.

But if we ever get the parcel post we must talk for it and work for it—and all together. All hands up for the parcel post!

INTENDING PURCHASERS.

The man who does not scan the advertising department of the Automobile Dealer and Repairer almost as carefully as the reading matter neglects his own interests. Sometimes we are asked which one of several devices is best for the same purpose, and naturally we cannot reply to an inquiry of this sort because to do so intelligently would require experiment and experience for a considerable time with each. When several parties are manufacturing a device for the same purpose, intending purchasers would do well to write to each for full description and testimonials. After these have been gone over carefully, the reader will undoubtedly be in a position to decide which one of the devices will best suit his particular purpose.

The same plan will apply to motor cars. It is practically impossible to judge, even after long experience, which motor car is best, providing there be any best, which is to be doubted, as there are lots of cars on the market of about equal merit. An intending purchaser should also interview his friends who own motor cars to get their views.

It is a rather important transaction to spend all the way from one thousand to five or six thousand dollars for a car and serious enough to deserve careful investigation on the part of the prospective purchaser.

PRIZES FOR BEST PRIVATE GARAGES.

For the purpose of giving information to readers who contemplate building private garages, we offer prizes of \$20, \$15 and \$10 each, for the first, second and third best designs of such structures, together with descriptions of their material, construction and fittings. Photographs of the buildings are desirable whenever possible and plans of interiors. These plans may be made in pencil if more convenient. They will be re-drawn by our artist for publication. Full details should be given, however, including dimensions and cost, so that the layman may use them as a guide to work from. It may be stated, likewise, that low rather than high cost will be considered a point of merit, and simplicity will count for more than imposing appearance.

An honorarium of the "Automobile Mechanician's Catechism," a book of 110 pages, bound in limp leather, for car owners, chauffeurs and garage men, will be presented to all who do not win a prize but who send in articles and drawings that can be used. This book is one of the best of the kind in compact form, and will be found extremely useful and instructive. Kindly send contributions for this department to Motor Vehicle Publishing Co., 24 Murray street, New York.

PNEUMATIC TIRES AND THE HIGHWAYS.

A recent communication in the New York Times commends that paper for its recognition of the road destruction caused by the automobile, and adds:

"The depreciation in value of residence property abutting on such roads in consequence of the dust raised by the rushing machines, if figured, would present even more impressive totals. The automobile is not the vandal. It is the pneumatic tire. The pneumatic tire has a sucking action on the surface of the

roadway as the rubber is lifted from contact by the forward motion of the wheel. This sucking action is much increased if the tire is slightly deflated. The pneumatic tire is a prerequisite for attaining illegal rates of speed. It can be dispensed with for moderate speeds. The use of pneumatic tires on power-driven vehicles on public highways should be prohibited."

The foregoing postulate in relation to the pneumatic tire is largely true, although at an extremely high speed any kind of a tire is destructive to the highway. On the other hand, the automobile may be driven at such a speed that it actually improves rather than injures the highway, but that speed is slower than should be required.

As to doing away with the pneumatic tire or prohibiting its use, it is simply impossible. The only consideration of this sort that could be entertained would be the adoption of metal tracks for the automobile wheels to run on. This last idea may not be so visionary as may be imagined when it is considered that they would be long-lived, that they would greatly lessen the necessary propulsive force, that the weight of the car might be thus greatly reduced, and lastly—and not by any means the least important—that if such tracks should be made so that the car would not leave them, it would require far less attention on the part of the car driver to keep the vehicle in the road.

THE HELP OF FRIENDS.

We should like to write a personal acknowledgment to each subscriber who has sent us a letter of approval of our efforts but as this is manifestly impracticable, we hope they will accept this announcement as a proof of our appreciation of their good will. Many subscribers have recommended our paper to their friends, and in many instances have sent addresses of friends with the suggestion that we send them sample copies. This is likewise greatly appreciated and responded to promptly. Undoubtedly many subscribers have been secured by this means.

As stated in a recent number, it is our ambition to add 10,000 new subscribers to our list this year and if each subscriber who is pleased with our publication will recommend it to some one or more of his friends, we shall probably accomplish our purpose.

THE NEW CAR.

When you get a new car do not put a wrench upon it. Let the carburetor, the magneto and the ignition alone. The car and all its accessories were put in perfect condition before they left the factory, and if by chance it fails to run as you think it should, the fault is the manufacturer's and not your own.

Nor is it wise to attempt to try out the car at once after it is received. The first thing to do is to give it the most minute and deliberate examination so that you may become thoroughly familiar with the mechanism and especially with the lubricating system. Read the book of instructions and carefully follow them.

If this advice be carried out it may save you a good deal of future trouble and cost.

Carbonic Gas for Tire Fillers.

The use of carbonic acid gas for tires to save the work of pumping them up on the road has about subsided. It is proven that gas loses its resiliency much faster than air, and there is constant danger of running with partially inflated tires without knowing it. No good substitute has yet been found for air as a reliable tire filler. Gas leaks out 43 per cent faster than air.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

No one is sure to always control a car unless he can always control himself. This self-control must cover mind as well as muscle—head as well as hand. The car that is being driven by someone who has had a drink or two—or three—is about the most dangerous thing that can be found on the highway. The ordinary pedestrian usually gets home safely even though his gait be unsteady from drink. It may make him reckless of speech, and possibly vulgar of speech, although liquor never makes a man brutal; it merely sends his inherent brutality to the surface. But he is not liable to do much physical harm, either to himself or to others. Yet get him hold of the driving wheel of a car and he is a menace to everything on the highway.

There is another dangerous class of drivers. They are afflicted with an over estimate of their own ability. They have little conception of the force of a body weighing a ton or more as it moves through space at the rate of thirty miles an hour. When passing another car they invariably try to see how near they can come to it without touching, and they go along with increasing recklessness until the sure to follow disaster teaches them a lesson that they may well remember to the longest day they live. The writer of this would resent being called a physical coward, yet he never sees a car coming at a rapid speed that he does not feel disposed to give it the entire highway rather than take the chance that the reckless on-comer may not feel disposed to give him any part of it, willy nilly.

The record of accidents is as long this month as usual, although few only are given herewith as examples of others.

Wants \$25,000 for Injury.—A New York City woman has begun suit for \$25,000 damages against the owner of another car as the result of a collision. As her car was going along, within the legal speed limits and on the proper side of the roadway it was crashed into by another automobile. The woman was thrown to the floor of the car and was picked up unconscious. She told the Court and jury she was hurt internally, her back and spine were injured and her head hurt. Asked what effect the injuries had had on her she replied:

"I am unfit to go anywhere, do anything or be anybody."

In a Bad Smash.—Racing along in Egg Harbor, N. J., at a mile a minute and with the road soft from a previous rain, a large touring automobile containing two men and two women, who, it is believed were joy riding, turned turtle and the entire party were pinned underneath the machine and severely injured. One of the women had a compound fracture of an arm, several broken ribs and internal injuries, while the other had a broken ankle and severe bruises. They appeared to be under the influence of liquor. They refused their names, but said New York City was their home. The machine was almost a total wreck.

Car Turned Turtle.—Near Houston, Texas, an automobile and a buggy came in collision and the car overturned pinning one man beneath who will probably die of a fractured skull. Eye-witnesses of the smash-up say that both vehicles were on the same side of the road and that in an attempt to avoid the buggy, the car was turned sharply towards the right. Just before reaching the ditch on the opposite side, the front wheel on the right bent under the car and was broken, the machine plunging down the five-foot decline, turning turtle and

throwing the party out upon the rocks at the side of the ditch. The driver was pinned under the car and the machine had to be lifted in order to get him out.

At Two O'Clock in the Morning.—As a rule young women who are out at two o'clock in the morning may be put down as reckless. This seems to have been the case in an accident in the suburbs of Pittsburg. The automobile turned turtle and stopped in a creek, pinning the women under the machine in the water. Both were badly bruised and nearly perished in the cold water before they were rescued. The auto driver alone was unable to get the women from under the machine.

Steering Gear Went Wrong.—Near Oxford, N. Y., a car was wrecked while going at a fast clip because the steering gear went wrong. The driver was experienced but he was unable to control the car and it went down into the ditch, hitting trees, rocks and what-not, breaking the top and wrecking the chassis. The car when stopped was reversed and headed in the opposite direction from which it started. A limb five or six inches in diameter from an apple tree was snapped off as though it was a light pine stick. Three fence posts were broken squarely off and quite a little fence was broken down and the palings smashed. The car was rigged up with wagon wheels and taken to a freight house.

The New York Automobile Law.

In response to inquiry in relation to the automobile law in New York State the following summary may be of interest:

The Car Owner May Be Arrested—1. Unless car is properly registered and bears plates front and rear furnished by Secretary of State, which are securely fastened to prevent swinging.

2. Unless car is equipped with adequate brakes, in good order.

3. If the plate of more than one State is displayed at the same time.

4. Unless at least two lights are shown in front, visible for 250 feet, and one light on rear, showing red rays, visible for 250 feet, and shining white on the number plate.

The Operator May Be Arrested—1. If he is under 18 years, unless accompanied by owner or licensed chauffeur.

2. If he fails to signal on approaching crossroads, outside city limits.

3. If he fails to signal on approaching pedestrian, intersection of road, corner, etc., when his view is obstructed.

4. If he fails to stop when signaled by persons riding, driving, leading horses, etc.

5. If he fails to use caution in passing street cars while discharging or taking on passengers.

6. If he fails to conform to the rules of turning to right or left.

7. If he violates any little technical law of the large city or country town.

8. For intoxication.

9. If he drives over 30 miles an hour.

10. For assault or homicide in case of accident.

The Chauffeur May Be Arrested—1. Unless he has passed examination made out by the Secretary of State.

2. Unless he has license in his possession.

3. Unless he is over 18 years of age.

4. Unless he wears metal badge conspicuously displayed.

5. Unless license is endorsed by himself.

6. For loaning license.



This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Inquirers will please write plainly and give full particulars of their trouble, stated as clearly as possible.

491

Wants More Power.

From A Subscriber, Ohio.—I have a Ford Model R four-cylinder, which has 50 lbs. of compression to the cylinder and a fly wheel, the weight of which is about 60 lbs. If I should put a plate in the upper part of the combustion chamber, would that make my compression any greater? At the same time that I do this I should like to put a band on my fly wheel so as to make it weigh about 100 lbs. Now by making my combustion chamber smaller and fly wheel heavier would I get more power? How can the compression of a cylinder be raised? What would be the result if the compression chamber be made smaller and the fly wheel heavier?

Reply.—So many factors are concerned in any proposed increase of compression and weight of fly wheel that we would under no circumstances attempt to change them except with at least the sanction of the manufacturer of the car. The Ford people have been making cars for a good many years, and it must be assumed that they have fixed the compression and weight of the fly wheel to correspond with the general structure of the motor and the work it is called upon to perform. It is true that the compression of the Ford motor is low and it is likewise true that there is a certain point beyond which the efficiency ratio begins to decrease rapidly. The Ford gear is three to one; we should quite as readily consider raising it for increase of power as to do as you contemplate. In any event, don't do anything until you confer with the manufacturer; while he may not naturally be enthusiastic about any change after he has given the subject a good deal of study and experiment, it would be unwise to make any radical change without at least his sanction.

492

A Slipping Clutch.

From Geo. E. Lawrence, Massachusetts.—Do you consider it a good plan to use over again the grease that oozes through the transmission case into the pan, after it has been strained through cheese cloth? Is there any way to tell when the leather clutch is slipping?

Reply.—Never use oil that has been in the pan, as it is sure to retain some grit and will destroy many times its value in bearings. If the clutch is slipping it will show on a grade when the motor is pulling hard. The motor will continue to run, but the car will slacken in speed and may stop if the clutch is very bad.

493

Battery Troubles.

From A. E. Else, Doland, South Dakota.—What is used to tell when a storage battery of from 60 to 80 ampere hours capacity has its proper filling? We can get some of the batteries we have charged to six volts and they last just long enough to get our lights turned on. Our cars are electric lighted and we wish a tester to tell us when these batteries are filled properly.

Reply.—You have to depend entirely upon the volt-

age to tell what condition the charge is in these batteries. They should show two volts per cell when fully charged. Your trouble is no doubt due to dirt or the plates may have been sulphated by charging too rapidly or discharging too low. Never discharge a battery lower than 1.7 volts per cell. Empty the acid out and wash the inside thoroughly with clear water, then refill with new acid. If no relief is obtained you will have to ship the batteries to the makers to have them overhauled.

494

High Tension Current.

From Harry Harsington, Iowa.—My car has two cylinders, dry battery under rear seat, and Splittorf jump spark coil on the dash. One lead from the battery attaches to the frame, forming the ground; the other lead is to the coil. From the (double) coil are four leads, two small wires to the timer and two heavy wires to the spark plugs. The question is, where is the return of the high tension current? The coil connections are covered with paraffine but it may be presumed that the low and high tension currents on either side have a common wire in the coil, otherwise there is no return for the spark current. If this be the scheme then why may not the high current return through the battery and thus rapidly destroy it?

Would it not be preferable to have a separate return for the high?

Reply.—The return of the high tension current is through the battery wire. This current has no effect on the batteries as the amperage is almost nothing. No trouble need be anticipated from this construction as it has been followed for years by all makers with no serious results. A separate return might be used but it would only be one more wire to look after and would give no better results.

495

May Be Out of Alignment.

From J. S. Smith, Maryland.—I have a two-cylinder car truck and am having trouble with the clutch. The clutch is the Auto car's patented clutch. My trouble is when I set the clutch in the bronze disk it sets up a grinding noise, but only when running idle. It makes no noise while in gear. I have tried oil but that doesn't help it any. The adjustment is all right. I am at a loss to know the trouble.

Reply.—As you are near many good repair shops we would suggest that you take this car to some of them and have it looked over. It is quite likely your trouble lies in the engine and transmission being out of line and would likely be more of a job than you would care to undertake to remedy.

496

A Transmission Trouble.

From W. F. West, Jr., Princeton, Indiana.—I wish to ask what is the trouble in the transmission of my Model 19 Buick car. After throwing out the clutch to engage the lever into low, when starting, there is a friction or grating sound as if the cogs do not fit properly. Also please tell me the best oils to use and how to remove rust on the throttles on the sector.

Reply.—Your trouble is caused by a dry bearing in the clutch cone. The inside of this cone is supported on the end of the crank shaft and is lubricated by the grease cup located near the center of this cone. Remove the grease cup and force through the hole an oil gun of light cylinder oil. Run the car for a day and then force in as much grease as it will hold. This grease cup should be given a few turns every time the car is used. Any good medium grade of cylinder oil will work well in the motor and transmission. Use heavy.

gear oil for the rear axle and medium grease for the cups and universal joint. Use fine emery cloth for the rust.

497 **Where the Trouble May Be.**

From J. S. Minor, Indiana.—I have a Model 10 Buick which I purchased last May and have driven the same about two thousand miles, but I have never made a trip with it when it did not take a jerking spell, similar to a skip in one of the cylinders. This is an irregular skip or jerk which will cause the clips on the springs to rattle and the whole car to jerk. Then again at times it will run just perfect for a distance at slow or fast speed. I have had some of the best auto workmen try to remedy this trouble but all of them failed. I think I understand an auto motor fairly well but this one has me stuck.

The magneto has been returned to the factory at Anderson, Ind., and found to be O. K. I have tried all sorts of adjustments with the contact screw, tested out all the wiring, and bought a whole new set of spark plugs which the Remy magneto people recommend and get a good spark through the plugs. I also took out every valve and ground them to a perfect seat and replaced them properly, so no leaks could occur around them or around the spark plugs. I also removed the cylinders and cleaned the pistons and cylinder heads out clean and found two or three rings with very small dark spots on them but on different pistons, and no one was enough to cause the compression to leak. Otherwise they appear to be in first-class shape. So far as we are able to tell the compression appears to be fairly good, and even although motor appears to rock sidewise, that is slightly, while running idle, as if all the cylinders were not pulling equally and at the same time makes considerable noise. Have had all sorts of adjustments on the carburetor, also removed it and took it to the Schebler Co. at Indianapolis and had it all worked over and inspected, but this did not remedy the trouble. I also examined the brake and transmission bands to see that they were not causing the trouble, jacked the car up and all the wheels turned perfectly free. A few days ago I put a cutout valve on and tried the car on the road and found car would jerk and rattle while motor was not missing a fire. Now if the cylinder rings with the small dark spots on was causing the compression to pass by them, would this not cause car to jerk regularly and if there was not more than one ring on any one piston with a spot one-quarter inch long would that cause the trouble?

Reply.—As you have gone thoroughly into the missing question and are convinced that the motor is firing evenly, we can offer only one suggestion as to where to look for the trouble. Many times this action has been found to be caused by a badly worn universal joint between the transmission and the drive shaft to the rear axle, or the poor adjustment of the gears in the axle. If either of these are causing your trouble it will be noted that if pulling on a slight grade no noise will be heard but will show clearly on a level or slight down grade.

498 **Two and Four Cycles.**

From a New Enthusiast, Ohio.—Will you please explain fully and clearly the difference between a two and a four cycle engine and the advantages and disadvantages claimed by the one over the other? Also the difference between a progressive and a selective transmission and which is generally considered best and why.

Reply.—In the two-cycle motor every down stroke is a power stroke. Instead of using mechanically operated valves to control the intake and exhaust gases as in the four-cycle, these gases are admitted and discharged through ports in the side of the cylinder wall which are covered and uncovered by the piston in its travels from top to bottom of the cylinder. In this type of motor there are only three moving parts, the piston, connecting rod and crank shaft. The gases are first admitted to the crank case, there compressed and passed to the cylinder through a port which is uncovered as the piston descends. As the piston reaches its lowest center it again starts upward covering this intake port, as the piston continues it compresses the gas in the top of the cylinder where it is ignited and by its expansion forces the piston down as the piston now nears the bottom of this stroke the exhaust port is uncovered, allowing the burnt gases to escape. As the piston moves a little farther down the intake port is again uncovered, allowing the fresh gas to rush in forcing out the remainder of the burnt gas the piston again raising repeats the described action, thus giving a power stroke on every revolution of the crank shaft.

The four-cycle system gives but one power stroke to two revolutions of the crank shaft and has the passage of the gases controlled by mechanically operated valves, this being accomplished by a cam shaft, driven through gears from the crank shaft, thus necessitating many more moving parts than used in the two-cycle. The functions of the four-cycles are, first the downward stroke of the piston with the intake valve open; the gas is drawn into the cylinder; as the piston reaches the bottom the intake valve is closed; the piston then travels up compressing the gas in the top of the cylinder where it is ignited by the spark, causing it to expand and force the piston down; at the bottom of this stroke the exhaust valve is opened, and as the piston again goes up, the burnt gases are forced out. When the piston reaches the top of the cylinder, the exhaust valve closes, the intake is again opened and the operation continues as before. The advantages and disadvantages of the two types it is hardly advisable to discuss in this place, so this point will have to be left to your own judgment. Much can be said in favor of both types.

The difference between progressive and selective transmissions is mainly in the method employed to make speed changes. In the former but one shifting member is used for all speeds and a continuous or progressive movement of the gear shifting lever gives in succession all speed ratios from reverse to the highest. In this form, if the low speed is engaged and it is desired to change to the high it is necessary to pass into intermediate and then into the high. Similarly if the high is engaged and the reverse is desired, the shifting member must pass into intermediate then into low before the reverse can be reached. In the selective, two shifting members are employed which allow the operator to select any gear desired and engage it without passing through any other gear.

499 **His Brush Car.**

From Francis Love, Ohio.—I have a few questions for your trouble department.

1—Would an ordinary steam gauge do to register air pressure in tires?

2—What should the compression be in a Brush Model D 4 inch in bore, 5 inch stroke?

3—My father is the owner of a Brush Runabout Model D. He used it all last season and it gave ex-

cellent service. It has a multiple disc clutch on low, high and reverse. One time when I tried to crank the engine I found it would not crank. It was stuck in high speed although the lever was out. I found that there was little or no grease in the transmission box. I filled it with coal oil and succeeded in loosening the clutch. It seemed to work properly after that, but about a week after, when I started the car, I noticed a noise that sounded a great deal like the gears in a street car. I had used the car the day before but it ran very quiet and smooth. I found on opening the transmission case that I had plenty of grease in the case. I let it all out and filled the transmission and differential cases with kerosene and let it soak over night and then replaced it with good lard oil, but it did not help the noise at all. I removed the transmission and took it completely apart and found nothing wrong, loose, broken or worn, also, the differential was in excellent condition to the best of my knowledge. I replaced the transmission and it still made that disagreeable noise. I thought that the bevel gears were not meshing right in the drive to the jack shaft, so I put in a cardboard gasket, separating them a little more. This neither improved nor changed the noise in the least. It is somewhere in the transmission, or differential because when the car is standing and the engine running, it is not heard nor felt. It is not in the rear wheels for they have been removed and replaced. Kindly help me in this matter if you can in your next issue.

Reply.—Any ordinary steam gauge is all right for air pressure.

The cylinder compression should be about 60 lbs. We would suggest that you take this machine to some good repair shop and have some one go over the bearings in this transmission and differential as it is probably a worn bearing that is causing your trouble by allowing the gears to separate or mesh too deep. In either case it would produce the noise you mention and soon ruin the gears.

500 No More Efficiency.

From Frank H. Fisher, New York.—In the head of the cylinders of my 1910 E. M. F. are both spark plugs and priming cups. I believe that by removing priming cups and inserting another set of spark plugs, I will have a more efficient motor. Will the magneto stand the extra drain?

Reply.—To use two sets of plugs with the magneto it would be necessary to have a double distributor on the magneto, so that the current would flow through the two plugs in series from one distributor to the other. If the two plugs are connected to your present system only on rare occasions would more than one plug work, as an electric current will always follow the course of least resistance; therefore if the points of one plug were only a small fraction closer together than the other, that would be the one to do all the work and the other would have no more effect than if it were not there.

501 Poor Gasoline.

From H. F. Smith, New York.—I have been somewhat dissatisfied with the quality of the gasoline I have been getting this winter of a certain concern and thought I would try some of the make of a rival maker. I keep my gasoline in a 100 gallon galvanized tank buried in the ground, encased in cement. I had perhaps 25 gallons in the tank when the rival concern put in 50 gallons more. When I came to use it, (I pump it through a rubber hose into the tank of the

car, strained through a chamois), I found a considerable quantity of stuff resembling frog spittle and a portion of the gas would not pass the chamois, evidently water. I tested the gas with a hydrometer and it registered 63. After trying to use this vile stuff for a few days I pumped it all out of the tank and threw the most of it away, reserving a small quantity for cleaning purposes. In five years' experience I never had anything like this before and would like to know what the cause of it is. The agent for the concern of whom I had bought regularly says it is gelatine in his rival's gasoline. This seems fishy to me. Maybe you can enlighten me and incidentally perhaps others who may have had a like experience.

Reply.—We are unable at this time to give you a satisfactory answer, as there seems to be quite a varied opinion as to what this substance is. However, a well-known chemist has consented to analyze some of it, and we hope to be able to publish the result in our next issue.

502 Cannot Be Done.

From Albert J. Gauvreau, Vermont.—I have a four-cylinder Reo, 1910 model, and would like to wire the same for electric light—all five lights—and would like to have the lights as they are now. Could I wire to the magneto?

Reply.—You cannot operate the lights from your magneto.

503 Skipping and a Dying Engine.

From Charles A. Meyer, New York.—In your next issue would you please help me out of the following difficulty through the columns of the "Trouble Department"? I have a six-cylinder, 50 H. P. touring car which, when run for a distance of 30 miles, begins to skip slightly. This skipping increases, until the engine dies and no amount of work or really experienced knowledge can make it run. I leave it here over night and the next day, the car runs in fine shape. It is not because the batteries are weak, for I have put new ones on and even had ten connected up at once. The car works excellently for short distances. I have a new Atwater-Kent Unisparker ignition system.

Reply.—The ordinary conditions under which your motor would work as described would be overheating, causing the valves to stick and in that way give you no compression in the motor, some stoppage of the gasoline line or a gradual running down of the batteries. Your claim of running thirty miles before the motor stops would indicate that it was not to be laid to those conditions, as in all probability they would not allow you to run over four to five miles. However, we think your trouble is due to the batteries. These batteries might run down in the distance mentioned, and by leaving the car standing over night the batteries would again come up and furnish current for a considerable run. We suggest that you carry a storage battery or another set of dry cells with you, and when the motor stops attach the new cells and see if this is not the cause of your trouble.

504 A Flooding Carburetor.

From G. F. Post, Wisconsin.—What can I do to stop my Schebler carburetor from flooding in cold weather?

Reply.—The flooding of your Schebler carburetor in cold weather is no doubt due to the fact that someone has raised the float to allow your starting the motor with less trouble. This will cause the carburetor to flood at all times when standing. Your only remedy

will be to again have this float lowered to the proper level, and if the car starts hard use the butterfly valve which is on the top of the intake. Or if this carburetor is not fitted with such a valve, lay a piece of cloth over this air intake and crank the motor with a couple of turns, then remove the cloth, put on your switch and start as usual.

505 **Not Advisable.**

From V. B. Garlock, New York.—Could I fill a Presto-lite tank from an acetylene tank which we have installed in the house if I had a pump, and what kind of a pump would I have to have?

Reply.—We would not advise trying to charge your Presto tank from your lighting generator, as this gas has to be of just such a tensivity, otherwise it will not work satisfactorily under high pressure. Also a pump of sufficient power to compress this gas would be quite expensive.

506 **The Engine Skips.**

From Chas. J. Hill, Maine.—My car is a Reo 1907, single cylinder and it skips, or did when I last used it, badly. Where would the trouble be likely to be located, in the timer or wiring? Is it best to let the air out of tires in the winter?

Reply.—The missing in your one-cylinder Reo may be found in either spark plug, carburetor, coil or a weak battery. We suggest that you first clean your spark plug and at the same time see that there are no small cracks in the porcelain. Adjust the point about 1-64 of an inch; take the contact points out of the coil; polish the points to a clean surface and adjust the same so that you get a very light contact but a rapid vibration of the vibrator. Clean the commutator thoroughly with kerosene and see that the contacts are well cleaned and meet squarely. Also install a set of new batteries, or if using a storage battery have it recharged. It would be well in this case to remove your carburetor and clean it thoroughly. See that there is no sediment in the bottom of the chamber and have the passages thoroughly cleaned.

When laying up your car in winter time it is well to let most of the air out of the tires, allowing enough to remain to just hold the tires in shape.

507 **Warm Air for the Carburetor.**

From A. M. Roesch, California.—Would it give satisfactory results to draw all the air for the carburetor through a jacket around the exhaust pipe? Would the drying of the air, which would occur from contact with the hot exhaust pipe be beneficial or otherwise? I have a four-cylinder Ford, using a Master vibrator. Is there any way that I can wire so that I may discard these four coils?

Reply.—In cold weather the result of drawing warm air through the carburetor would be very satisfactory. You might discard your four coils by installing a distributor in the high tension line, but we hardly think this would be advisable on your car.

508 **Correct Horse Power.**

From J. H., Iowa.—I would like to have you answer in your next issue of your magazine what is the correct horsepower of an engine of 4 cylinders, with 4 inch bore and 4 inch stroke. The make of the car is the Buick.

Reply.—The horsepower of this motor would be 25 3-5.

509 **Vulcanizers.**

From a Brother Reader, Connecticut.—I presume many of the readers have used vulcanizers. I see all kinds advertised—electric, steam and heat. I would like to ask through your paper which is the quickest and best.

Reply.—Possibly some reader will feel like giving their experience with vulcanizers.

510 **New Cams Needed.**

From Edgar C. McCall, New Jersey.—In setting the valves (by means of push rod adjustment) on my Maxwell AA 1910 runabout so that exhaust opens and inlet closes exactly on the flywheel marks, I find that exhaust closes *before* dead center and inlet opens *at* about dead center, instead of each at a few degrees after dead center as marked on the flywheel. The valve gear is meshed according to the maker's tooth marks. In other words, the valves do not stay open as long as they should, according to the maker's marks.

1.—Will worn cams cause this?

2.—Will worn push rods (ends next the cams) cause this? These ends are bevelled as you know. The agent tells me that it takes an expert to set the valves correctly, and that one tooth either way will make all the difference. I cannot see that one tooth either way will lengthen the time that the valves remain open.

3.—Will it do so?

4.—Would you recommend new cams?

5.—Would the valves set according to the first paragraph cause the engine to run hotter than usual?

Reply.—No doubt worn cams are responsible for your trouble as the length of the push rods would not effect the throw of the valves if properly adjusted. It would be advisable to have new cams put in as the condition you mention certainly would cause heating.

511 **Half Throttle Range Only.**

From George R. Leonard, M. D., Indiana.—I have a Brush runabout equipped with a Kingston carburetor. In climbing a hill the gasoline throttle works good as I advance it, for about one-half open. If I open it more than half way, it either has no effect whatever or else it shuts the engine down; that is, the spread begins to lessen. If I pull the throttle back about half open, the engine begins to work better. I want to know why I cannot use the full range of the throttle? If adjusted rightly should not the engine pull most when wide open?

Reply.—Your trouble may be cured by giving a little more gasoline at the adjustment. It is now adjusted so low that you only get sufficient gasoline for the air admitted at half throttle.

512 **Priming the Carburetor.**

From Sidney Prince, Massachusetts.—In your next issue will you please inform me why in priming the carburetor of my Model 24 Overland car it is necessary for me to hold the primer down for at least 15 or 20 seconds before I can get the carburetor to flood. I am obliged to repeat the operation in many cases. By repeat I mean that the gasoline will not always flow by simply holding the primer down. I am obliged to release the primer and then repeat the holding and the gasoline will then come with a rush and overflow into the drip pan for a half hour unless the engine is started up. It will drip a drop (so to speak) about every four seconds. This dripping does not occur after the engine has been running, but priming will have to be repeated after the engine gets cold.

Reply.—The length of time you have to hold down the priming is due to this primer touching the float and

pressing it down very little and this allows the gasoline to flow slowly into the float chamber until it overflows the aspirator. By lengthening this priming pin so that it would press the float down farther you not only would be able to prime much quicker but would not have to repeat the operation as is now necessary.

513 Carburetor Adjustment.

From I. D. Wilson, California.—I have a Maxwell 5-passenger 1910 car and find it a good machine but it requires too much gasoline. It gives less than one-half the mileage I was led to expect on the purchase and am unable to get anyone who can remedy the trouble. No change of adjustment of the carburetor seems to meet the case. The carburetor is the one the Maxwell use on all their cars I am told, but is not satisfactory. Yet I do not know how or where to get a better one. Every fellow says his is the best.

Reply.—There are so many causes for the excess consumption of gasoline that it would be hard to attempt to set you right without seeing the car and conditions, so we suggest that you consult some good repair man in your city, or write the nearest Maxwell agency which will send some one to investigate the matter. The Maxwell car gives an unusually good mileage for the amount of gasoline consumed, their carburetor is a good one, and no firm in business is more courteous or responsive to its patrons.

514 A Knock and a Rattle.

From Lewis C. Miller, Indiana.—I have a four-cylinder, 1910 Model, Ford touring car. It has been run one season and has had the best of care. I drive it myself. It has run 2600 miles. Now when I am going along on high gear the engine seems to knock and make a rattling noise as if something had a lost motion. The knock is light and can hardly be heard, and the rattling noise much resembles the shaking of a pen knife with a loose blade. I think that the knock and the rattling noise are one and the same thing. Should I have the trouble looked into by an expert or can I remedy it myself? Will cold weather injure tires when not in use? Should they be taken off the wheels and kept in some moderately warm place or not, or should the whole wheel be taken off the machine and put away in the winter without removing the time from the wheel? Also, my machine does not start very often the first time I crank it, but it takes five or six cranks after the carburetor has been primed and is overflowing. I have a good strong spark. Is the fault in the valves or the carburetor? I have had experts to work on the carburetor and find nothing the matter with it. Yet it does not crank or start the least bit easier. Connections and spark plugs are all right. I do not think there is any leak between the carburetor and the explosion chamber, and it is my opinion that the valves are leaky although I have never seen them. Please tell me how to remedy this defect.

Reply.—As the small noises in your car are very hard to locate sometimes it might be better to have someone trained to that work examine the car. At the same time he might give you the cause of hard starting. However this latter trouble is usually caused by poor adjustment of the carburetor. If the valves are in bad condition it would make it still harder to start. Tires, when not in use, should be kept at a moderate temperature and out of strong light. A temperature above freezing will not injure the rubber.

Likes the Unisarker.

From Guy B. Carroll, Iowa.—I have read two issues of your magazine and note that the Trouble Department

is mainly filled up with Ford ignition, and no wonder. This is the poorest part of the car. We have not followed the advice given by some of your writers, by adding a magneto driven at excessive speed which necessitates the retention of the trouble sometimes, but have discarded the quadruple coil and timer with their attendant vibrators, wires, puncturing condensers and other troubles, and attached Atwater-Kent Unisarkers, completely eliminating all ignition trouble, and obtaining power and speed beyond our most sanguine expectations.

Those not familiar with synchronized ignition or the Unisarker, would do well to study the latter. The manufacturers can furnish special glass and brackets to attach the instrument to all models of the Ford as well as several other makes of cars. The device is not new and is being used as standard equipment on nineteen makes of cars this year; some making it their only system. We have placed twelve on the following makes of cars: Mitchell, Ford, Buick, Maxwell, International and Stoddard-Dayton. On two Model "S" Fords we replaced other ignition systems allowing nothing in exchange, which shows the value of the instrument as recognized by the purchasers.

Mr. Duryea on Spark Starting.

From Chas. E. Duryea, Penna.—I am pleased to give Mr. Oldknow a few words on starting on the spark. There is no comparison between striking the piston a blow with a sledge and striking it the same blow with a soft gas cushion. The sledge blow is softened by the elasticity of the metal only and would quickly crack or forge the piston. The gas blow does no damage whatever. The hardest blow an engine can receive from the explosion is given when it is running at fair speed and misses one explosion and then gets the next one by premature ignition before the dead center. It then has a larger, purer charge than common, and getting it before dead center, it throws a very severe strain on the parts. In spark starting the charge is never compressed so the pressures are very low. Then the cylinder is usually cold which slows the combustion and renders it a push rather than a blow. The piston must be in a favorable position to move away from the blow or the engine will not start. The mixture is seldom perfect for such a slow speed. So it will be seen that spark starting does not impose strains worth mentioning.

Coil Trouble.

From Charles A. Meyer, New York.—I notice that to the inquiry 4 of H. J. Buckmaster of Ohio, you replied that the insulation of the coil had been broken down. It happens that I have had considerable experience with these coils, and although your answer may indeed hold good, I find that this coil gives a fine buzz at the vibrator but will not give a spark unless two new batteries are used, that is, after the coil has had a season's use. The only thing to do in this case is to get new coils. New springs, vibrators and platinum points will not overcome this, moreover, these batteries will only run a six cylinder car over a distance of from 30-50 miles with the units in this condition.

I would add that the trouble I experienced with my car has been proven to be a fault of the ignition.

The Rattle In the Ford Accounted For.

From F. J. P., New York.—I would like to say to W. C. Tillotson, M.D., that the Fords in this locality have no metallic clicking when running light. They run as smooth as any car at all speeds up hill or down. Of course, if the bearings are loose, you can't expect it. I have been repairing Fords for quite a while and find that

the rattle is the ball bearing in the drive shaft as I explained it in the November number, page 1198. I have fixed quite a number with that rattle or hoarse vibration when run from 20 to 30 miles an hour.

Let me say to W. M. H., of Eastern Maine, that if your fenders and lamps are tight and your car has the vibration or rattle only when running above 15 miles an hour, look at the ball bearing back of the roller in the drive shaft. You will find the thrust collar broke. Try this. It was the last thing I looked at.

Lubricating Oil.

From E. Nelson, South Dakota.—I have been a reader of your journal for some time and read with interest items in the Trouble Department. I have not noticed anyone experience the trouble I had with my Model 10 Buick, and it was only by a very agreeable accident that I discovered the cause of the trouble. I was told when purchasing the machine that high grade lubricant was essential for the life of the car, and a brand of oil manufactured by the Standard Oil Company called Vacuum "A" was highly endorsed and which I used, but which proved to be the cause of all my trouble. As long as I used the above grade of oil I experienced nothing but trouble with my motor, giving no power and no spark, and no one seemed able to ascribe the cause, until by accident I changed my lubricating oil and bought the Standard Oil Company's "Polarine" lubricant, and ever after using this oil have never once had any trouble with my car in power, spark, etc., which proves conclusively that the lubricating oil is the cause of a large percentage of the troubles.

How Trouble was Stopped In a Model N Ford.

Frank H. Barnes, Connecticut.—Regarding the letter in Trouble Department, January issue, No. 467, would say that I had the same trouble with a Model N Ford that I once owned and after over-hauling the ignition, carburetor, etc., to no avail I finally noticed that the feed pipe running from the gasoline tank to the carburetor was directly above and close to the exhaust pipe. After running some distance when the exhaust pipe became hot the gasoline would vaporize in the pipe before it reached the carburetor and the engine would get weak and finally stop. After moving the feed pipe to one side some three or four inches I had no further trouble.

I am now driving a Model T and enjoy, very much the articles regarding that machine in your Trouble Department.

Improving the Fuel.

From A. T. Jones, Hyde Park, (No state given).—I saw in your magazine where some one recommended putting a half pint of oil to five gallons of gasoline, and said the result would be given later. I have been keeping watch ever since and have never seen anything more about it. Please give me full particulars as I wish to learn if there is anything to improve the gasoline as they seem to be making it poorer all the time and charging more money. By answering the above you will confer me a great favor.

Note by the editor.—Mr. Jones would have been replied to as he requested if he had given his State address. An hour's search of our subscription lists did not reveal the address. Possibly this notice may result in some one giving him the information he seeks. We know of no oil that would be likely to improve the fuel of a gasoline engine.

A Plea for Lighter Cars.

From C. L. v. Berg, Iowa.—After having owned a "featherweight" car for the past four years, actual

weight about 1,100 pounds, and costing less than \$1,000, multi cylinder engine, sliding gear, shaft driven and wood sills, that has gone more miles over all kinds of roads winter and summer and at higher speed than any heavyweight local car and has never been pulled. I am safe in saying it is good for four years more at less expense for repairs than any new heavyweight car made. The above I refer to local owners of cars here, among which are a representative line of heavyweight machines.

Aside from local work I have covered 6,000 miles of touring through the Bad Lands of South Dakota and over gumbo trails where few machines ever have gone and those which did were either dead in the road, or were pulled back by actual horsepower and a man driving them. Dead weight and lack of road clearance is what killed them.

When a modern American locomotive (which has no equal) and on which a certain weight must be had for tractive purposes, is groomed down to the very limit for the strength required, how wrong it must be to furnish power to carry dead weight in a railway coach, and much worse through mud and up steep grades, simply to overcome defective design. A lumber wagon is heavier than a whalebone buggy, but could not the buggy carry its passengers twice as fast and still more comfortable?

Owners of heavyweight cars in this city admit it is impossible to keep on the rear seat crossing ordinary crossings and claim our old wood-silled machine, without strut rods and stiff half elliptic springs, rides much easier. Will not a light car glide over uneven roads, while at the same speed, will not the heavy car fall deeper in the ruts? Does not this take more power from the motor, and does not the extra ton of dead weight take more power, and what motor is so well balanced it does not jar the car doing this extra work? Surely not one under six cylinders.

This is an airship age. A light weight reform is on. One maker just advised the trade his competitors have claimed his car weighed 3,995 pounds, whereas he says it only weighs 3,922. Another maker, who mentioned how heavy and substantial his car was, is now telling how many horsepower it has for pounds weight of car.

Our foreign makers have claimed heavy weight stored momentum down hill to help ascend the next hill. Alas, the man who meets a team at the bottom finds this a dream.

For the good of every maker, every owner and every one connected with the auto business, let us all demand larger wheels, a lighter and a stronger car, having a frame more flexible than a soap box with axles nailed to its bottom, and so get an easier riding car with less breakdowns, and show our foreign cousins we can lead them in auto building the same as we have in many other things, and not have to copy their obsolete models.

The Automobile Bete Noir.

From W. D. T., Illinois.—As a reader and an auto and gas engine mechanic, the different theories and ideas of people who own and run automobiles makes me wonder how some of them do as well as they do. What they know about machinery isn't worth speaking of. The time is now in my mind coming very fast when an automobile mechanic will be of little use, but I hope that the automobile industry will increase so that it will call for the need of the small town auto repair man. In 1879 and up to 1890 the self-binder was in demand, but at that time the self-

binder expert was scarce. I quit my shop and traveled for the firms handling binders, McCormick, Deering, Wood and Esterley, working nine years. Now do you see a binder expert traveling? No; the binder is a common piece of machinery and any farmer boy can run and care for one. This is coming with the automobile. In a few years more the machinery will be so perfect and well understood that any ordinary unskilled man can make his own repairs or send to the factory and get the parts and put them in the machine he owns as easy as he can a wheel or casting on a self-binder. There are but two troubles with the automobile now which holds back thousands of people from buying and these are the ignition system and the carburetor. The carburetor is the heart of the machine and if it doesn't act the machine doesn't work. The batteries are like the lungs of a human being. Now when these are constructed so the common, ordinary man can understand and operate them, the automobile trade will increase faster than at this time of the history of the automobile making world.

Ether for Balky Motors.

From O. H. Hampton, Indiana.—Some time ago your paper had a short article on the use of ether for starting balky motors. It so happened that the writer has a motor that was always troublesome about starting in cold weather. It just wouldn't start without giving the carburetor a dose of hot water. The first trial with ether put a stop to that motor's contrariness, and incidentally to the "cuss words" that its contrariness usually provoked. A single teaspoonful of ether poured into the auxiliary air valve (the valve in this carburetor opens downward from the top), starts the motor on the second turn of the crank. This motor is now accompanied by a little squirt can filled with ether and two squirts into the valve does the business. One of our boys calls it "the tickler." The usual place to apply the ether would be in the priming cups, but this particular motor has no cups.

The above is only one instance of a number of valuable hints and suggestions which have been published from time to time to our profit.

Chains and Sprockets.

From E. P. Randall, New York.—I have read with interest the experiences of different correspondents to your paper, particularly one from O. H. Hampton in the January issue in relation to changing sprockets from one side to the other of the car. As far as the sprockets are concerned I would say that is all right, but when you come to reverse the chain that is worn out it does not make things all right as the worn chain has lost the pitch by the rivets and blocks being worn. That is, each link has worn with the rivet (say for example 1-32 of an inch). Now in 32 links the chain has worn one inch out of pitch. Say for example that the chain has 128 links, then the wear would be just 4 inches longer than it was when new. In regard to the sprockets, the distance from one side of one sprocket tooth to the same side of the next tooth remains the same as when new, as each tooth has worn the same. But reversing the chain or turning the chain over would not remedy the trouble as the chain would climb the sprocket teeth just the same. The only remedy that I can see would be to just put on new chains, and my experience is, never use a block chain, for the reason that as the chain wears the blocks will climb the sprocket teeth and then slide down the teeth, and soon the teeth are worn, or rather cut, by the chain blocks thus sliding. Roller chains are very

much longer lived, and the sprocket teeth much longer lived than the chain. I took off a bicycle chain the other day that the owner was unable to keep on the sprocket on account of its climbing the teeth of the sprocket. When I laid the old chain on the bench beside the new chain I found the new one was four links shorter, although it had the same number of links. I have tried to explain the chain and sprocket question so those in trouble will understand it.

To Ford Car Owners.

From D. S. Pensyl, Pennsylvania.—I would like to inform "A Friend" from New York that his suggestion to No. 433 F. R. Mans, N. Dakota in the February issue, is wrong. The Standard Oil Co. manufacture Polarine Grease and Polarine Gas Motor Oil of a very high non-carbon grade that gives the best of satisfaction in the Ford "T" car. Mr. Mans of N. Dakota will have no trouble with Polarine Motor Oil. His troubles are from some other source. By the way, this journal is extending a great courtesy to Ford owners in this trouble department. It is a great help to us all. Let us show some appreciation by spreading the news to other Ford owners who would also appreciate these suggestions and criticisms as we are. There are 60,000 of us at least.

Likes to Hear From Mr. Pembroke.

From F. P. Tolles, Connecticut.—Have always had much help from your Trouble Department answers to Tom, Dick and Harry and the rest of the boys, by your expert and recently also from criticisms by Mr. C. J. Pembroke, New York. I hope he will continue to keep up the fire.

Wish also to express appreciation for the explanation and remark of Mr. E. H. Metcalf, N. H., and also possibly help somebody else by reporting the cure I had already found for the difficulty. I drilled a $\frac{1}{8}$ inch hole in the intake close up to the left hand cylinder which proved too large, but showed I was on the right track. Then by partially plugging the hole I struck the proper balance between the cylinders and I had it.

Ignition Improvement.

From J. H. Blane, Tennessee.—In regard to inquiry of W. D. Humphrey, Kentucky, if he will install a K-W combined lighting and ignition low tension magneto in his car there will be no need of a storage battery as this will generate sufficient current for both ignition and head lights, but if he wishes to get more mileage from dry cells and continue this means of ignition would suggest that he get a Delco coil. This will run his car 2,000 miles on six dry cells.

Starting the Motor on the Spark.

From Seth Symmonds, Illinois.—While starting the motor on the spark is regarded by many as being injurious to the bearings, etc., I would like to state for the benefit of the chauffeur of some of the read-wise owners that the explosion is not like a hammer blow but is slow owing to the fact that you must have a rich mixture before it will start on the spark and your compression is light owing to the fact that your piston is not way up to the top of the cylinder. I am a professional repair man and offer my knowledge as I have profited greatly by many articles in your magazine. I would suggest that you pay more attention to your mixture to save your motor and be careful that you are not getting too fine a mixture as that will cause what may be called a hammer-blow explosion.

In adjusting your carburetor you will find that you

can give the same just enough gas to stop missing and then turn on quite considerable more and still not miss. Since your motor heats if it has too much gas the way to determine your mixture is to find both extremes and adjust between them. If on running your bevels do not make a steady purr turn off a very little gas.

Carburation is generally so little understood and is such a great item in the life and efficiency of a motor that it is best to let a real expert adjust it. So much can be said on carburation that I would like to hear it discussed more.

What will an indicating card show on a medium compressioned motor at, say, four hundred revolutions per minute and one thousand per minute with a carburetor of the auxiliary air valve type?

Will Some One Reply?

From Charles A. Conro, Wisconsin.—I note R. Clyde King's complaint on backfiring, which has also been bothering in my White Steamer, Model O, but I am confident none of the causes stated in the reply are mine, I have had these parts thoroughly looked over and defective parts replaced with new, yet, after a hard run or on a hill pull, when the car gets hot, then the trouble begins. I would like to hear further on this subject.

Also I would like to learn of a thorough and safe way to clean the generator.

Ford Car Specialties.

From F. Turner, Rhode Island.—Will you kindly advise me through your columns who the manufacturers are of the several specialties for Ford cars; such as oil gauges, timer attachments, electric light outfits, etc. I have seen these advertised extensively in the different magazines, but can not seem to locate any of the advertisements now.

Note by the Editor.—For anything of this sort it would quite likely be as well to send to the Ford factory.

Automobiles Per Capita.

From W. Richardson, Wyoming.—I saw an article in the Automobile Dealer and Repairer some time ago which claimed that some city in Ohio had the largest number of automobiles per capita of any city in the United States. They had an automobile for every 75 inhabitants.

Cheyenne, Wyo., in addition to having the fastest four mile speedway in the world has 256 registered automobiles.

The last census gave us a population of 11,332. That would be an automobile for every forty-four inhabitants and more automobiles are coming all the time.

Three Kinds of Polarine.

From I. W. Overton, North Dakota.—On page 64 of February issue "A Friend" of New York wants you to advise F. R. Mans, North Dakota that "Polarine," made by Standard Oil Co., is a gear grease and not a cylinder oil. Please tell A Friend for me that he has his "lines crossed," for Polarine is not a gear grease, on the contrary it is one of the best lubricating oils made and is particularly adapted to the "Ford" car. I have run my Model T Ford 13,000 miles and have never used anything else but Polarine as a lubricant and my engine is in perfect condition.

Note by the editor.—It should be stated that there are three grades of Polarine, namely: Polarine oil, Polarine grease and Polarine transmission grease. It is not a good

idea to "get those children mixed." According to reports they are each excellent for the purpose designed. We have received scores of letters concerning this matter for which we thank our readers.

Paying First and Finding Out After.

From George J. Edwards, Ohio.—Mr. Dailey's article and your notation at the bottom recalls an experience I had with a firm in Detroit, Mich. They claim to have parts for any car. First you send the money for the part. Mine was \$4.25. Then they hunt the junk piles of Detroit for the piece. They send you an old worn out part, and of course you send it back and that's the end. One man told me of making a trip to the factory in person to get his money back and did get it. But that would not pay me on this amount. They have a small factory and I took them to be reliable. But you pay first and find out after.

Brazing Compound Wanted.

From Louis A. Allard, Massachusetts.—Would D. J. Pemberton of Kansas tell us through your columns what kind of brazing compound he uses for cast iron and also state what kind of heat?

Kerosene as an Engine Cooler.

From John W. Johnson, Indiana.—I would like to ask if any reader has ever tried coal oil as a cooler instead of water?

Steering Gear Dangers.

Ralph D. Palma, the well-known racing driver, says: "What I consider the most dangerous thing that can happen to a man in a race is to have something go wrong with the steering gear. Under almost any other circumstances a driver can do things in an emergency, if he is quick enough, that will save him, but a breaking steering gear renders him practically helpless instantly, for it is seldom possible to apply the brakes and bring the car to a stop before it is ditched or before it hits something.

"At Guttenburg on Thanksgiving Day my car broke a steering knuckle while going at a 70-mile-an-hour clip, and while I skidded into a ditch and brought the machine to a stop without upsetting, it was one of the closest calls I ever had.

"At Danbury last year the same thing happened, and I plunged through a fence. I broke a thigh on that occasion, although I did not know it until I crawled out of the wreck and tried to walk.

"When tires burst they frequently cause upsets, but a skilled driver is often able to control his car if the steering column is working properly. A right rear tire blowing up has a tendency to make the car slew around to the right and a rear left-hand blowout to the left, unless the car happens to be turning. If a car is skidding when a tire bursts the rear of the car usually swings with a jump in the direction in which it is skidding. When front tires blow out the skid is toward the side with the torn casing. Of course, it does not always work out this way, but a quick twist of the steering wheel often prevents accident, for a driver can usually tell which tire it is that rips."

Starting and the Batteries.

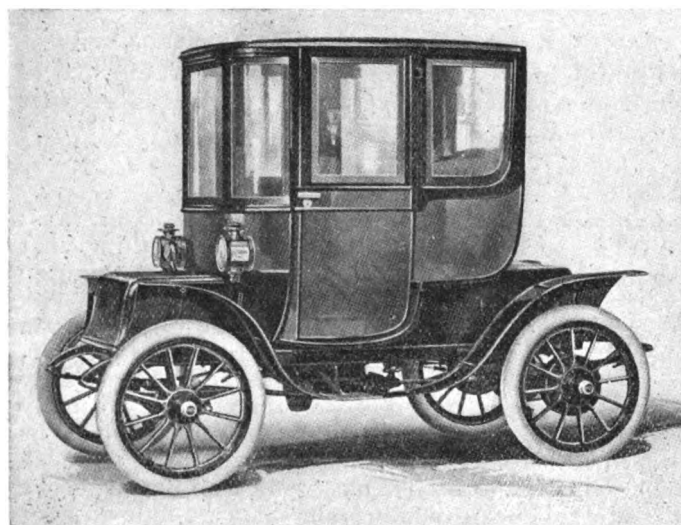
The question is asked whether a storage battery is better for starting a car than a brace of dry cells. It makes no difference whether voltage comes from a "dry" battery or a "wet" battery, provided it is on hand when it is needed. The trouble with starting on

a dynamo, or magneto is that there is no current of any sort till the magneto starts, and the magneto cannot start till the engine starts. In a number of small cars, it is possible to give the magneto sufficient impulse from the crank turned by hand to get a spark for the first explosion, after which the magneto takes care of the rest. Many cars carry a storage battery for starting, and switch over onto the magneto after the engine is running.

ELECTRIC VEHICLES.

Have Some Decided Advantages and Sales are Steadily Increasing.

The possibility that electricity may sooner or later be the universal propelling power of motor vehicles should not be overlooked. Of course, this is at present what may be termed a "far cry" but the sales of electric vehicles are increasing right along, and despite the recent undoubted improvement of storage batteries, there is likely to be still further advance. The day has passed when a range of forty miles on a single battery load was considered a rare thing. Electric automobiles with an assured radius of 150 miles and



Extension coupe.

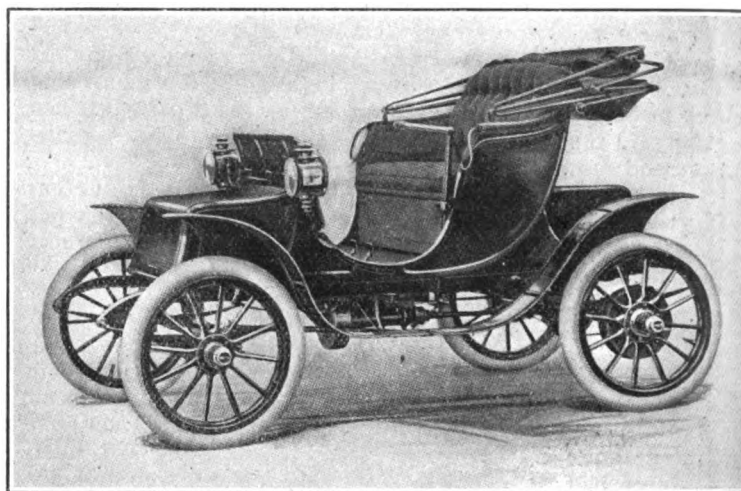
perhaps a great deal more can now be had. The theory of the sale of the electric is that it may easily be run by the purchaser without the services of a chauffeur. Women, who are the chief users of electrics in the city, handle the cars themselves.

New York City hasn't anywhere near the number of electrics that are to be found in Detroit, Cleveland or Chicago. Traffic conditions here are blamed partly for that.

In the case of the electric the natural movements of an individual in stopping and starting are duplicated in its control system. A person trying when hurrying down a hall to avoid bumping into some other person draws back with the hands and braces the feet. Duplicating these motions with control lever and foot brake stops an electric. To start the lever is pushed in the direction of progress.

Simplicity and cleanliness are points in favor of the electric. Another point its supporters make is that when the desire for great speed becomes unfashionable the electric will come into its own. On the points of speed and hill climbing ability the electric vehicle adherents do not contend they are in the class with the gasoline vehicle makers. They urge, however, they have all the speed and distance that are rational,

and that when people get tired of paying for chauffeurs and want to return to the saner life chiefly in town car driving, the electric will be largely sold. In fact they say that in five years from now the elec-



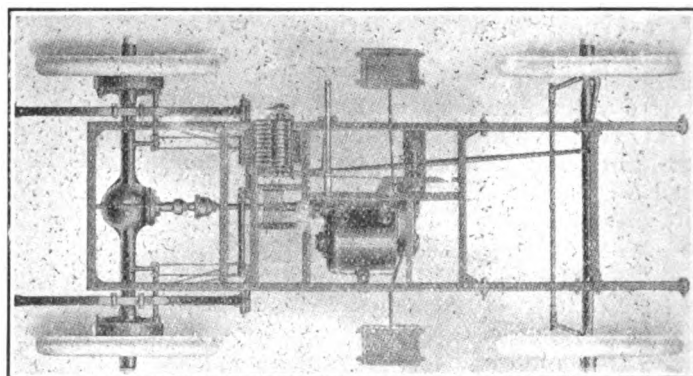
Queen Victoria.

tric will be more popular in New York City than it has been generally thought it would be.

Persons who have good sized incomes generally adopt the electric as the short haul adjunct to their motor forces. That is, they run the big touring cars in the open country, but when it comes to city running they have the electric.

The chief point of difference in the electrics of today and of yesterday is in respects to batteries, most of which now afford greater radius of operation. The new Edison nickel-iron storage battery has been adopted by some of the makers in their product and the Baker electric gives a choice of either the Baker or Edison battery. With the standard lead battery the mileage varies in ordinary use, according to conditions, from 60 to 100 miles on a single charge, and with Edison batteries under similar conditions, from 90 to 150 miles. Traveling 100 miles on city streets means nearly seven hours' steady driving at the rate of 15 miles an hour—a very considerable performance for a town car or suburban vehicle.

The Baker electric which is used for the illustra-

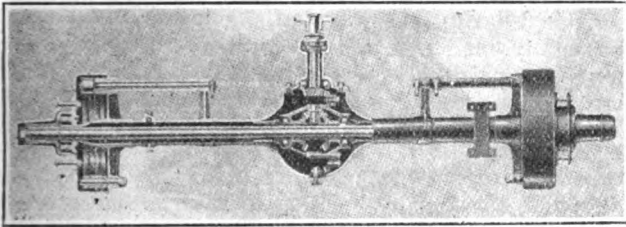


Bevel gear shaft drive chassis.

tions presented herewith, is a shaft-driven silent and smooth running car. Last November one of these cars, equipped with forty cells of A6 Edison battery, was driven 244½ miles on a single charge, at an average speed of 12 2-3 miles per hour. The car was a stock car, and the route covered such streets and roads in and about Cleveland as would be met with in the ordinary daily use of a car. This is the highest mile-

age record ever attained by electrics under any conditions.

The owner of an electric cannot only operate and care for it himself but he can recharge it if he cares to do so. The charging apparatus, which takes current from an electric light service, is simple and inexpensive, and requires very little attention. The cost of the current is small. Where alternating current is available, the charging is done by means of a mer-



Rear axle.

cury arc rectifier. Where direct current is used, a charging rheostat is necessary. Both kinds of apparatus are reliable and simple in their operation. Aside from the cost of the current, an electric requires practically no expense for maintenance. It needs oiling very seldom. None of the important working parts require much attention in the course of a season.

DOCTORING OLD CARS.

How They May be Invigorated and Their Lives Prolonged at Little Expense.

From O. H. Hampton, Indiana.—Sooner or later comes the time in the life of every car when "things begin to get loose" and to prevent rapid injury and to stop the noise, something has to be done. The man who has no time to bother with the matter and has money to burn, will of course, turn the whole thing over to some repair shop, grumble at the big bill charged for the work, pay it and forget it.

There are, however, a great many car owners who have not so much wealth, to whom the upkeep of a car becomes a serious matter. If he buys repair parts from the makers of the car, he soon finds that the prices charged for the same are downright robbery. The car makers, some of them at least, seem to think that the car owner has to get repair parts from them or throw the car away, and the charges are based accordingly. There are also a lot of garages and repair shops where the idea seems to be that anyone who is fool enough to own a car is fool enough to stand any charges that they may demand.

As an illustration of extravagant repair shop charges, here is just one instance. A shaft drive housing had the neck or part of the housing which telescopes over the outer tube of the rear axle broken off in an accident. It was about like a funnel that had had the neck or spout broken off from the body of the funnel. The housing was made of aluminum, and its owner sent a description of the work to be done to a firm who advertised that they mended aluminum castings and asked for an estimate of the cost of the work. The firm replied that they could say nothing as to the cost of the repair, without first seeing it, except that it would not cost as much as a new casting and would be just as good. The owner then sent the work to them, telling them he must have the cost named before work was begun. The firm wrote the owner that their bill would be \$18. The owner at once ordered the housing returned to him

and set out to find somebody who did not want all the money he had for doing one day's work. In his own town he soon found a firm who said they would do it for 50 cents an hour for the labor. After looking at the work this firm said that the job could be much better done by making bronze castings of such shape that six sections of the casting would fully enclose the housing where it was broken and then rivet the castings in place with plenty of rivets. It was done that way and it was a beautiful piece of work and much stronger than it ever was. The bill was:

5½ hours' work at 50 cts.....	\$2.75
Brass castings at 24 cts.....	.84

Total\$3 59

Any comment on the above is not worth while. If a car owner has a reasonable amount of mechanical talent and a fairly skillful pair of hands, he can double the life of the wearing parts of his car at a trifling expense for anything except the value of his time. If he has not these qualifications, he can find some chap in his town that has them, and in most cases this sort of chap wants to learn all about cars, and will be mighty glad to keep it in order for the privilege of a little use of the car now and then.

No expensive shop outfit will be needed. Wrenches, screw drivers, cold chisels, hack saws, drill bits, a small drill press, and as may be needed, a few other tools of small cost. Ten dollars will buy all that is needed. Now he is ready for business. There has begun to be a slight bounding, apparently inside of the crank case. Take off the parts that enclose the piston and crank bearings; feel of the crank bearings. Feel of all these bearings to find whether there is any lost motion or looseness. Possibly the piston pin bearing in the connecting rod is loose. There is where that knocking is. Take the piston pin out, detach the other end of the connecting rod from its crank bearing and take the connecting rod to the work bench. The bushing is just a brass, bronze or Babbitt metal tube which has been driven into the hole through the end of the connecting rod. Drive the bushing out, put it in the vise and split it with a hack saw. Don't split it into two halves but just saw one slit lengthwise of the bushing. Tighten the bushing in the vise till the sawed edges are pressed together; then try the piston pin in the bushing. If the pin fits snugly it is all right. Just a little too tight to be got in by the hand will do. Now line the hole in the connecting rod with a piece of tin and drive the bushing into the hole. If the bushing goes in too tight use a narrower strip of the tin. The bearing will now stay snug as long as it did before it got loose. One piece bushings all over the car can be tightened in the same way.

Two piece bushings like those on the crank shaft can be tightened by taking them out and filing away a little of the metal at the joints, or perhaps you will find that the edges have shims or liners between the edges. In that case take out some of these until a snug fit is obtained. If the liners are used, see to it that just enough of them are used for the bolt to bind them tightly in between the edges of the bushing when bolt is drawn tight.

If You Want to Sell or Buy.

If you want to sell your car or any accessories connected with it, or anything else, or if you want to buy anything in the automobile line, an advertisement in our classified list will no doubt accomplish your purpose. These little advertisements are inexpensive, only costing three cents a word for each insertion, including the ad-

dress, and they generally produce results right away, so our advertisers tell us. Postage stamps will be received in payment. No advertisement however small is inserted for less than fifty cents.

It Will Pay to Be Careful.

When exposed to air, gasoline forms a highly explosive vapor. The vapor so formed is heavier than the air, and, instead of rising, it falls close to the floor, under the work bench or counter, and in other out-of-the-way places. There is always the possibility of this vapor being ignited either by a stray match or by the sparks from a discarded cigar or cigarette, by the short-circuiting of electric wires, sparks from the furnace, exposed flames in car lamps, gasoline torch, etc. You know what will follow the ignition of the vapor; your property will not only be damaged by the explosion or subsequent fire, but your employees and yourself are in danger of losing your lives. There are so many different systems on the market to-day for the storing of gasoline that there is no excuse for the careless and inadequate arrangements so often met with in some garages.

Water in the Carburetor.

It must be remembered that the water must be actually in the gasoline system, and not in the induction pipe or spray chamber to do any harm. The water generally reaches the jet, and chokes this intermittently. The symptoms are—strong firing for one moment, weak firing the next, and complete misfiring another. These are also symptoms of some ignition troubles, such as run down accumulators, so that the cause of the trouble is often overlooked and much inconvenience is caused. On testing the carburetor it seems to work all right in spite of the presence of water, so that the only thing to do if the presence of water is suspected is to clear the jet and the passage from the float chamber to the jet, as if these were obstructed.

How to Get Good Roads.

We have printed the articles which have appeared in this journal on the King Drag and its availability for making ordinary dirt roads, in a little pamphlet, which we can furnish at \$1.00 a hundred and pay the postage to any of our readers, who may wish to distribute it where it will do good.

The King Drag will construct good dirt roads at a lower cost than anything else ever devised. Car owners interested in good roads should be able to stir up public feeling in their favor by distributing these pamphlets among the more enterprising citizens in their own localities. The pamphlet gives details as to the construction of the King Drag and how to use it.

That Expensive Cigarette.

Would it not be a good practice to carry a box of cigarettes in the automobile when going to the garage? When the repairman stops to roll a cigarette give him one ready made. You can afford to give him a box full for the price you are paying for his time taken to roll one of his own. This suggestion is not made with the idea of encouraging smoking in the garage for such practice should be strictly forbidden but it is only too well known that too many garage men smoke in the wrong place and at the wrong time.

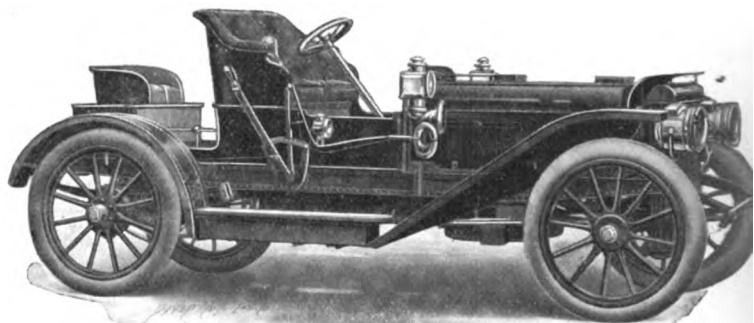
STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

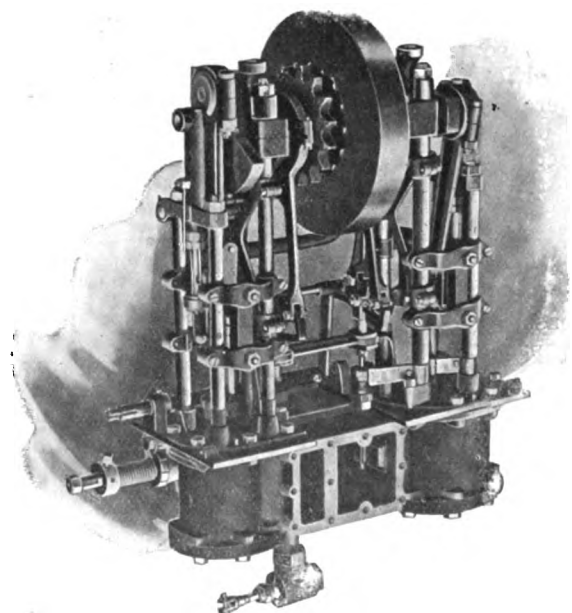
Lane Steam Cars for 1911.

From Charles D. Sherman, Connecticut.—I wonder how many readers could give the correct name of the city in which these cars are made or could give any information in regard to them; not many, I will venture to say. For the purpose of obtaining some up-to-date



Lane runabout—Model 24.

information in regard to these cars, the writer made a special trip from New Haven to the Hudson River by the way of Hartford the last week in February and has made a note of some of the things learned and information obtained as a result of this trip for the benefit of those readers who are specially interested in the new



The Lane engine (oil case removed.)

steam department. The Lane Steam Cars are manufactured by the Lane Motor Vehicle Co. of Poughkeepsie, N. Y., and were first sold in 1900. Since that time, each succeeding year has witnessed some change in general design and detail of construction as experience has proved desirable, so that the Lane Steam Car for 1911 is the result of eleven consecutive years of manufacturing experience. Up to 1905, no attempt was made to build them in quantities or place them on the market. A few

were built each year, more with the view of perfecting them than to market them.

In the Spring of 1905, the demand for these cars commenced and has steadily increased each year. Up to 1907, but one style of car (runabout) was offered, but with the opening of the season of 1907, four models were placed on the market.

For the season of 1911, three models are being placed on the market. Model 24 is the runabout; 20 horsepower and sells for \$1,350.

Model 25 is the small 5-passenger touring car; 20 horsepower and sells for \$1,600. Model 26 is the 7-passenger high powered touring car; 30 horsepower and sells for \$2,750.

The same power plant is used in the small touring car that is used in the runabout. The boiler is located under the hood, immediately in front of the head, with the water tank ahead of it and the condenser in front of the tank. The engine is a cross compound with slide valves, encased; fly-wheel in center and placed in an inclined position under the front foot-board, and the transmission is direct from the engine by one chain to the center of the axle. The Lane cars use beveled gear equalizers and the gears are all enclosed and running in oil. The boiler in the Lane Steam Car is known as the "semi-flash" type. It possesses the economy of the flash type, combined with the reserve of the power common to these carrying a water level. It furnishes steam uniformly superheated under all changes of load. The boiler pressure is set at 400 pounds.

His Steamer Experience.

From J. Harris Wright, Massachusetts.—After having had about ten years' experience with automobiles and during this time owning eleven steam cars I can't agree with those who do not like them. I have bought ten old steamers and fixed them up and used them with but very little outlay in money and with really little or no trouble. I have sold each one at a good profit and every car has as far as I know given good satisfaction.

I now run a big White Steamer, carrying 6 when I have not got 8 to 10 in it, which has been many a time for short distances. This car has been on long runs, one of 248 miles in one day, without a mishap and in one run for 125 miles without a stop. Last fall it was driven to New York and up to northern New Jersey and over 48 miles of mountains with no roads to speak of without a mishap. The last day's run with four passengers was 209 miles.

The only trouble I have had was when the car was put in a garage and it will be the last. It was put there for a small knock and came out with a large bill which I did not pay in full and I had to take the engine out myself and get new parts and replace the work. Since then it has run for a long time without one cent of trouble. There is not a car made that will run itself or without some expense, but in two years I have paid out just \$78 for new tires and two new head lights and a generator. I traveled last season, about 6000 miles on kerosene for fuel and no tire trouble whatever outside of punctures. A tire on a steamer will outwear three to five on a gas car. This I am told by men of experience with both cars and tire repairers.

Not one man in thirty is fit to run a car. Most of the bad smash-ups are by experienced men who know too much. Inexperienced men know better than to take such chances as the experienced do.

The only drawback I find with a steamer is the firing up. I once drove into a garage and went to dinner. When I came back I saw a man cranking a big gas car. He said he would think I would get tired of firing up. Well,

I left the garage in about five minutes and he was still cranking and using some pretty bad words.

We had two men here who broke their arms cranking last summer and one lady nearly lost her life trying to crank a small car.

With the steamer you get no smoky bad smell as you do with the gas car and no risk of one's life while trying to start. When it comes to the hills you have only to open the throttle and slide up while the gas car has the shifting of gears which will keep a man busy.

A short time ago a man with a gas car asked me why so many were driving the steamers. He said the roads were full of them. One of the biggest auto dealers of Boston told me last fall their output had been double what it was every year before. No doubt there are men who have had bad luck with the steamer but a hundred have had worse luck with the gas car.

White Steamers.

The White Motor Company deny the truth of the rumors that they are to discontinue the manufacture of steam cars. One of their agents says:

"The fact alone that we are selling more White Steamers than ever before ought to be sufficient evidence that our company would not discontinue trade of such immense volume, which it has taken several years to build up. There is an ever-increasing demand for setam motor cars. Never in the history of the White business has there been such rosy prospects for the White steamer.

"I am unable to ascertain where and what could have started such a rumor. When these rumors first appeared they were laughed at by the officials of the company, but when they reached such enormous dimensions it was decided to try to down them. Of course, our making of White gasoline cars has possibly exceeded the output of steam cars, but, to say the least, no such thing as abandoning the steam-car business has ever entered into the company plans."

Why Tires Wear Out.

President H. A. Mathews of the Jackson Automobile Co., is authority for the statement that a great percentage of auto builders fail to distribute the weight of their cars properly and that as a result the owner's tire bills are increased.

Weight distribution is shown to count for much in the wear of the tires and attention is called to the fact that it is almost impossible for the engineers to tell exactly where the dead weight in the car is to come, it being largely a matter of compromise.

Even when the greatest weight is in front, the rear tires always get more wear than those in front. The fact is cited that while in horse-drawn vehicles the wheels are pulled over obstacles, in propelled ones they are pushed by tractive force. The big manufacturers declare that the life of a tire is inversely proportional to the cube of the load which it supports. The matter of equalizing the weight on each side of the machine is a matter of great importance. The chassis builders make the best mechanical product they can and leave the matter of tires to the tire men, forgetting that the owner's satisfaction can only result from their working together. An improper balance of a car always increases the cost of running.

Rear Tires Run 12,000 Miles.

That a pair of rear tires on a touring car can travel 12,000 miles without puncture or trouble of any description seems incredible, but scores of people in Winnipeg, Canada, are willing to vouch for such a record established by tires on a Franklin car owned

by D. McDonald. The car is a four-cylinder, twenty-eight horsepower touring model and was placed in service about two years ago. Since then it has been run almost continuously even through the deep snows. Ten dollars, Mr. McDonald states, is an extremely high limit for his total tire expense since he placed the car in service. The record, he states, is due to the light weight of the automobile coupled with the large tires. Another Winnipeg man, who has made a record, is Edward Cass, who has driven 7,000 miles with a forty-two horsepower Franklin and has had no punctures.

A Wind Automobile.

"Blasphemia" is the name of a windsled which has been built at Saranac Lake, N. Y., by three young men who mounted a Franklin motor on a sled of light and resilient construction and now have a vehicle which has made 60 and 70 miles an hour over the ice of the lake.

The propeller is like that of an aeroplane and is back of the sleigh. The idea originated with H. Webb Hyde of Boston and Carl Palmer, and they, assisted by J. B. Marvin of Louisville, Ky., built the craft. The drive shaft runs from the motor under the seat to the propeller at the rear of the sled. Steepling is through the rear runners. As a matter of fact the machine has two sets of runners and two propellers. One set of runners which are rounded are used when there is a firm layer of snow on the ice. The other runners are skate-like and are used on glary ice. One propeller, seven feet across, and with a small pitch, is used when there is snow. The other propeller is smaller and is used when the ice is smooth.

Battery Troubles.

A storage battery should be fully discharged and recharged at stated intervals in order to preserve its efficiency. Many operators have wasted much energy and time in cranking their cars, feeling confident that the battery was all right because it had not been used very much. With a normal battery charge, say of not less than six volts, the transforming coils should not refuse to work. If so, a thorough examination should be made of all the primary connections, including those of the timer. It very often happens that the contact maker in the timer becomes disarranged, permitting an open circuit. This result is the same as produced by an open switch, only worse to overcome. In order to remedy this, one must have a working knowledge of the engine in order to properly reset the timer. This accomplished, with the order of firing correct, the coils should respond in their respective order. If not, the vibrators should be cleaned and adjusted by ear until each in its vibration resembles the buzz of the bumble bee.

Erratic Running at Low Speeds.

Some owners find, after they have had a car in use for twelve months or so, that the running of the engine at low speeds is erratic, both when the car is stationary and when it is moving along the road. For instance, sometimes with the throttle lever on the wheel set at a particular point the engine will run at four hundred revolutions per minute; at other times with the lever on exactly the same spot the engine will come to a standstill almost immediately. The cause of this want of uniform control is often the slackness which develops in the various joints and connections

of the throttle. Between the hand lever and the actual throttle valve in the inlet pipe, some cars have as many as six or eight joints, and the slightest wear at each one of these will in the aggregate amount to a considerable movement at the throttle valve itself. Consequently by moving the lever a certain amount one is never sure that the throttle is not moved considerably more or considerably less. The remedy is obvious; the slackness of the various joints and connections must be taken up. The same defect is sometimes existent in the ignition control, but with this the inconsistency is not nearly so noticeable. A slight risk is, however, attendant on slackness of ignition control joints, in that when starting the engine the safety point in the setting of the "advance" may be passed and a backfire may result.

The Torbensen Trucks.

The Torbensen Truck Works, Bloomfield, N. J., are pioneers in construction of commercial cars and built their first gasoline motor truck in 1904. They realized very early that a power wagon which aspired to succeed the horse had to be made of sterner material than a pleasure vehicle. Since that time they have been constantly at work improving, strengthening and simplifying. They have succeeded in bringing out a 1½ ton truck that employs shaft drive with a solid, one-piece, dead rear-axle. The axle proper which carries the load is of I beam construction of extraordinary stiffness and strength, yet comparatively light in weight, and it carries as a component part of it the jackshaft with its differential and driving gears enclosed in dust-proof casings and driving direct to the hubs of the wheels. This eliminates the troubles incident to exposed side chains, does away with distance rods and the necessity for constant adjustment and saves cost of chains and sprockets. R. G. Schultz is the agent of this truck for New Jersey and he has an office at 50 Orange street, Newark.

Premature Ignition.

One frequent cause of pre-ignition is failure of water circulation. If this should be suspected, it can be proved easily whether it is at fault by placing the hand on the radiators and water-jacket. If the former are almost cold, while the cylinder jacket is exceedingly hot, it will at once be understood that the pump is not working, or that there is an air lock in the radiator piping. The best way to deal with the failure in either of these cases is to disconnect the outlet pipe from the pump and run the engine. If the water is not discharged, it is obvious that the pump is not working, while on the other hand, if the water tank is filled up while the engine is running, the air lock will probably be removed.

Not One Car But Twenty.

A "fleet" of cars is no extraordinary thing for a very wealthy New York family to-day. Such men as John Jacob Astor, Frederick G. Bourne and C. K. J. Billings would feel poorly off if they had but half a dozen cars at their command. Mr. Bourne has some thirty or forty, unless he has very recently cut down his motor stable. John Jacob Astor has possibly close to twenty cars of all types, for every conceivable use. Billings has many horses for pleasure and luxury but for business and to "get there" he uses automobiles.

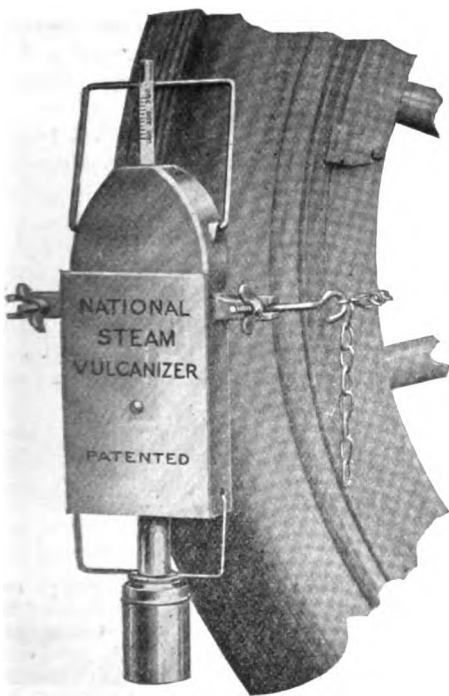
U-AUTO-C

HOW SIMPLE IT IS TO OPERATE, AND WHAT PERFECT WORK YOU CAN DO YOURSELF WITH A

“NATIONAL” STEAM VULCANIZER **(THE KIND EVERYBODY BUYS NOW)**

There are very good reasons why the “National” Steam Vulcanizer in one year and a half has become the most popular Vulcanizer on the market. Here are a few:

The “NATIONAL” is heated by STEAM and will not burn the tire if it becomes a little too hot. It is filled with water at the factory and never needs refilling. It can be carried in the tool box and used in the country or anywhere. It will repair both tubes and casings of any size, and operates on any part of the tire right up to the rim. It works very fast, as a higher temperature can be used with steam than with electricity or any other DRY-HEATED vulcanizer. Only an ounce of alcohol is necessary to do any job, which makes it the cheapest vulcanizer to use. The entire outfit is highly polished and nickel plated. There are no coils to burn out, nor any part that can get out of order. It will last a lifetime. The worth of the “National” has been proved by thousands of users all over the world. It will stand every test.



The “National” Steam Vulcanizer is especially adapted for the individual owner who knows nothing of vulcanizing. It is small in size but a giant in the work it will do.

**Satisfaction is
Absolutely Guaranteed
or Money Back.**

SPECIAL OFFER: Send us \$12.00 and we will ship you a “National”

Steam Vulcanizer and complete outfit of all supplies and instructions promptly by express prepaid. TRY IT 30 DAYS AND IF IT IS NOT ENTIRELY SATISFACTORY IN EVERY RESPECT, RETURN IT TO US AND WE WILL SEND YOUR MONEY BACK.

MANUFACTURED BY

THE NATIONAL MOTOR SUPPLY COMPANY

1916 Euclid Avenue,

Cleveland, O.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

TIMING.

As It Applies to Both Magneto and Valves.

Timing a magneto requires great care or it is likely to cause trouble. Advancing or retarding by simply one or two teeth is usually all that is necessary. At the outset, and before setting out into the region of armatures, brushes and distributors, be certain that available literature on the subject has been mastered and an acquaintance formed with the machine about to be explored. Nowadays so many excellent handbooks have been published describing in detail all the ignition systems in common, or uncommon, use that the discovery of the "maximum position," etc., should present no difficulty. A very slight alteration will generally have quite a considerable effect. Cases have been known where advancing the magneto one tooth increased the speed of the car by five miles an hour, and yet one tooth more produced a knock which must have imperilled every connecting rod and bearing in the engine. Here, then, as in everything else connected with the internal combustion engine, avoid excessive alteration at one adjustment.

While on the subject of the timing of the magneto, it is worth while to consider whether any advantages are likely to be gained by experimenting with the timing of the inlet and exhaust valves. The rough idea is, as nearly every motorist knows, that the exhaust valve should begin to open just before the end of the firing stroke, and the inlet valve at the beginning of the suction stroke, but practically every engine has its own individual variation of the general rule. In the majority of cases the most effective setting has presumably been ascertained before the chassis left the works, but as there is no particular danger in slightly altering the timing of the valves, there is no reason against, at any rate, verifying this setting, keeping in mind that the two objects in view are to get the largest possible charge of explosive mixture into the cylinder, and to ensure the most complete expulsion of the burnt gases. In one case a bad loss of compression was found to be due to the inlet valve staying open too long, involving an alteration of the timing. The fact that any alteration in the relative position of the half-time wheels means taking down the radiator and removing the front of the crank case is to a certain extent a guarantee against light-hearted meddling.

Muffler Designs.

In their endeavor to silence the noise from the exhaust, motor manufacturers quite often send out a muffler that serves the purpose quite effectively but at the expense of 15 to 30 per cent. of the power of the engine.

The writer has had opportunity to make many

practical experiments along this line, and invariably found that the engine without an exhaust pipe at all exhausting directly into the open air, from the port on the engine, developed more power than where an exhaust pipe was used.

The longer the exhaust pipe and the greater number of short turns or sharp angles in it, the greater was the loss in power. The length and turns in the exhaust pipe can be carried to such an extent as to equal in power loss a close muffler or silencer. A long exhaust pipe and a silencer on the end of it may practically put the engine out of commission, so far as power output is concerned.

We recall an instance where an engine, in a printing office, gave trouble from the time of its installation until three months thereafter it failed to supply power enough to drive the presses, and in fact scarcely enough to keep itself in motion.

The exhaust pipe was 10 feet on the horizontal from the engine to the outside of the building and 35 feet perpendicular on the outside to the top of the building and a silencer on top of the exhaust pipe. There was one ell in the pipe just as it left the exhaust valve and one where the horizontal joined the vertical pipe.

When the perpendicular was disconnected and the engine had for its exhaust pipe only 10 feet and one ell to the open air, it not only had power to drive the presses but plenty of surplus power. It also ran like a new engine when compared with its performance prior to the disconnection of the muffler and vertical pipe. It showed further improvement when the horizontal pipe and ell were disconnected. In fact, was all that the owners could wish so far as the running was concerned. But, of course, they were not willing to stand for the noise in the room. This was readily overcome by the use of ten feet of pipe a size larger than the regular led to the outside of the room into a strong iron tank, one joint of a 2½ feet diameter boiler drilled full of small holes. The engine served with this exhaust and muffler, acceptably for years and never showed weakness in power thereafter.

The important thing to consider in an exhaust muffler is free vent and plenty of space in the container. Anything that will break up the direct force and admit it to the open air by many small avenues.

A type of silencer for a stationary engine may be entirely out of the question in automobile service, and consequently the multiple cavity silencers, with free small port intercommunication and with a liberal space capacity and free egress port into the open air is considered the best solution of the muffler problem at this time.

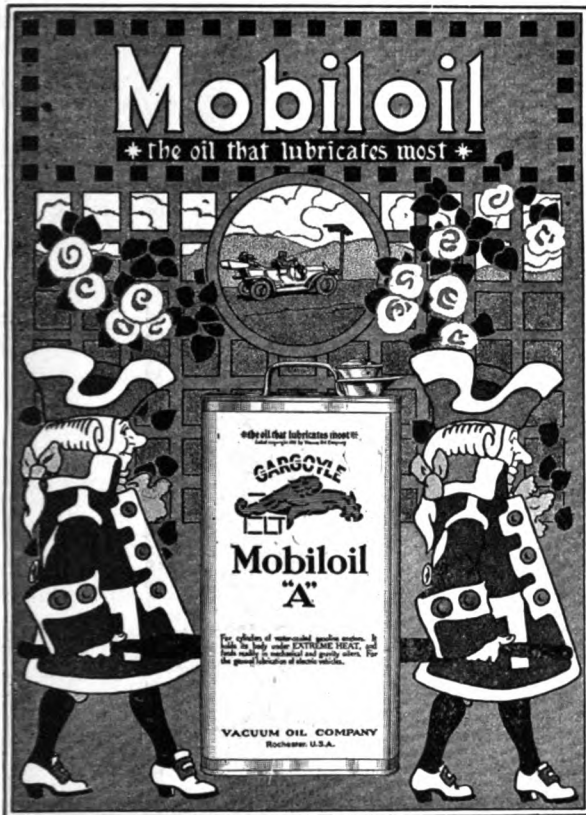
But as stated at the beginning of this article, many of the devices for this purpose are not as carefully designed as they might be and consequently do not serve the engine to the best advantage.

Hess-Bright Ball Bearings.—The use of annular ball bearings for automobiles is increasing rapidly. Not only do the separators for the balls of this form of bearings result in a minimizing of wear and friction, but they require no adjustment. For new work, or in displacing plain or other forms of bearings that prove unsatisfactory, it is advisable to secure the Hess-Bright bearings which is the pioneer of this form of bearing, thus insuring the maximum of durability and accuracy. Car owners should insist upon their use even though the re-

pair man suggests some cheap make. Cheapness is the highest extravagance in the case of bearings, for the difference in cost is slight while the difference in results is as wide as the poles.

A Remarkable Typewriter Proposition.—Large numbers of our readers, no doubt, use typewriters. Some of them must be in need of new ones. If so, they will be interested in the extremely liberal proposition of the Fox Typewriter Company, 6601-6611 Front street, Grand Rapids, Mich. This company is

willing to send one of its typewriters on free trial to any one anywhere, and it will be sent at the expense of the company, and if you do not like it, you can return it at the expense of the company. If you do like it, as low a payment as 20 cents a day will be accepted. We can recommend these typewriters, because we have three of them in use in our office constantly. They make several different styles, therefore it might be well for you to send for a catalogue first and pick out the one you would like to try. See advertisement.



A Novel Car Lock.

A gas lock, which is an effective preventive of the work of automobile "borrowers" and thieves, is an attachment seen on the Franklin cars at the automobile shows.

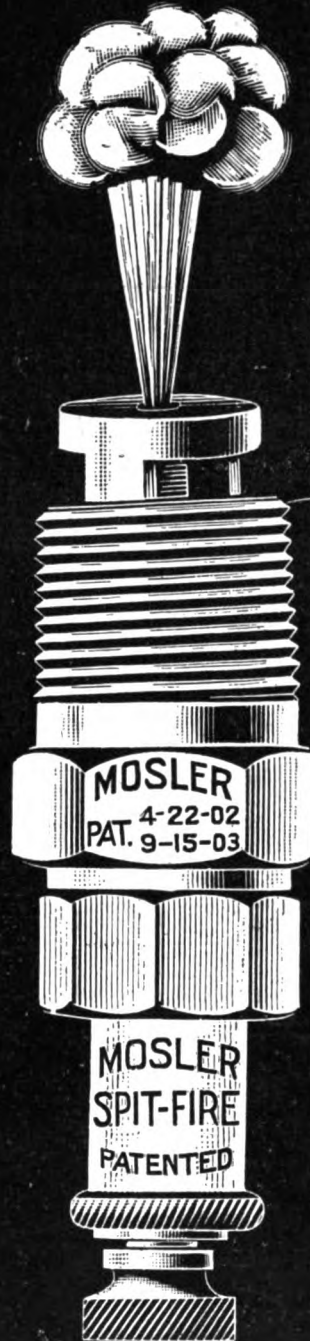
The locking device, using a ball and tumbler, is located in the sill under the front seat on the drive side. It consists of a stationary dial in the center of which is a knurled knob which revolves in the dial but which can be locked. On the knob is a mark, and on the dial are four marks. When the marks on knob and dial correspond the words on the dial indicates the position of the knob. When the operator desires to drive the car he turns the knob to the lower position on the dial marked "main." This indicates that gasoline is flowing to the carburetor from the main gasoline tank. If the knob is turned to the forward position on the dial the word "reserve" indicates that gasoline is being drawn from the reserve tank.

The backward position on the dial is marked "drain" and "closed." When the dial is turned to that position the flow to the carburetor is cut off and the motor cannot be run until the knob is turned to "main" or "reserve." In this same position the turning of a stop knob beneath the gasoline tank permits the draining of that receptacle. However, when the supply to the carburetor is cut off in this position the knob cannot be locked nor can it be locked in either the "main" or "reserve" positions. This backward "closed" position is desirable when a man wishes to leave his car for a few minutes and desires to shut off his supply of gasoline but does not want to go to the trouble of locking it. A person unfamiliar with the workings of the gas lock would be unable to start the car under those conditions even if the gasoline were not locked.

Mosler Spit Fire

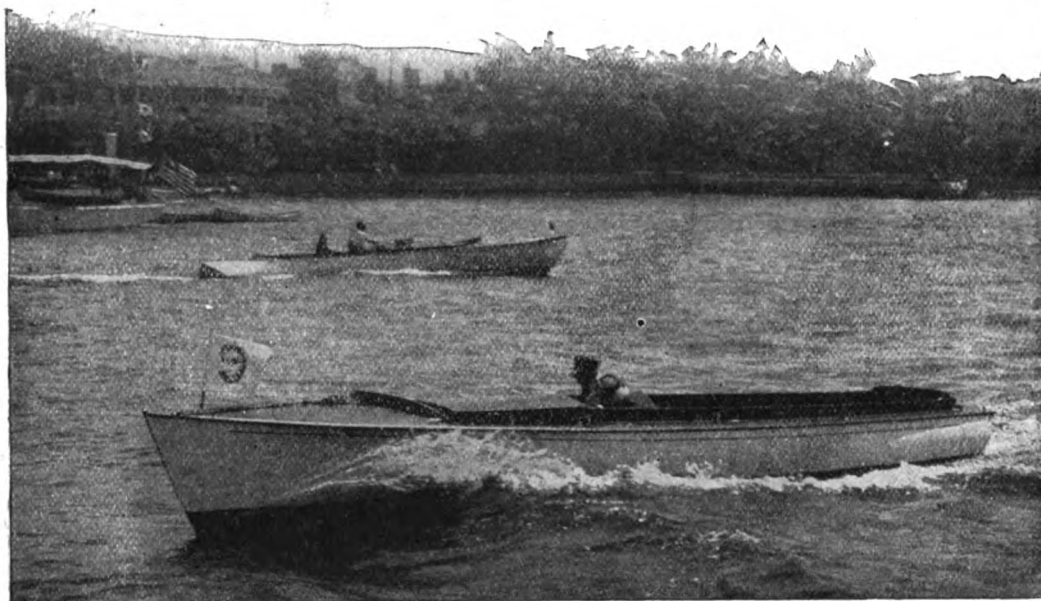
THE PLUG WITH THE DEEPEST CHAMBER

Made to fit any Engine any Thread



Magneto Type-Battery Type-Breech-Block Type The plug with the handle

A. R. MOSLER & Co.
163 W 29TH ST. NEW YORK.



**Are You Looking for a Boat ?
Are You Trying to Decide on an Engine ?
Is the Subject of a Proper Boat Outfit Puzzling You ?**

IF you are one of the many thousands of men who are this year contemplating the purchase of their first motor craft, you will find the splendid APRIL EQUIPMENT NUMBER of the great boating magazine YACHTING worth more to you than two years of any other publication.

The greatest authorities in the motor boat field have contributed their best efforts to this special issue, which will tell you just what kind of a boat to buy for your specific use—the type of engine best adapted to the various craft—how to fit and furnish the cabin—just what the Government Regulations are for different sizes of motor boats, and what equipment will be needed to comply with them.

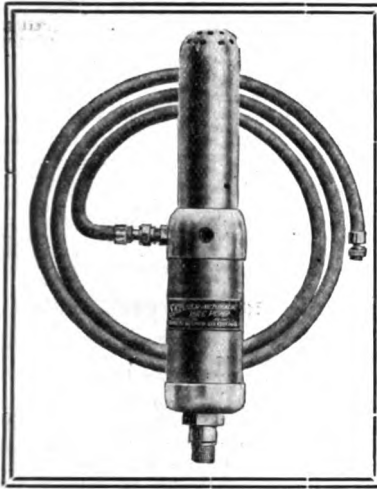
The April issue of YACHTING is the greatest practical guide to motor boating that has ever been published. The following splendid collection of authoritative articles as well as many other interesting stories and plans will appear in this April Equipment number.

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The "PNEU-FLATOR"

Let Your Motor Pump Up Your Tires

THE SKINNER AUTOMATIC TIRE PUMP is a true air compressor of the "step up" type, pneumatically operated by one cylinder of a Four Cycle gasoline engine (not operative on the Two Cycle Type). Silent and Vibrationless in operation, producing volume and pressure sufficient to inflate the largest tire with *pure air* which is chilled after compression by our patented convector system, producing a perfectly inflated tire not possible with high speed, gear-driven, friction operated tire pumps, which are noisy, gear-stripping, expensive of installation, and actually pump only, heated air to the tire.

It pumps the air you breathe, convects the heat generated by compression, and does not depend on high speed and a flood of oil to obtain its pressure and volume. Its pistons are air cushioned, automatically checking the length of stroke and prevents wear or damage when pumping against a deflated tire, or when changing hose from one tire to another; a patented feature rendering the device absolutely fool-proof.

The price is final. No further expense for insulation or adapting after the purchase of this device. The removal of a spark plug and substituting thereof the pump (using the hands only), and disconnecting the ignition of the second plug if the dual system is used, is all that is required.

Strong—Compact—Light—Carried in the tool box—it is instantly available for service at all times without expert mechanical knowledge or up-keep expense on the part of the possessor.

Price \$15.00 Each Pressure Gauge \$3.50 extra. 10 Days Free Trial to responsible owners. Give name and model of car, and size of Spark Plug when ordering.

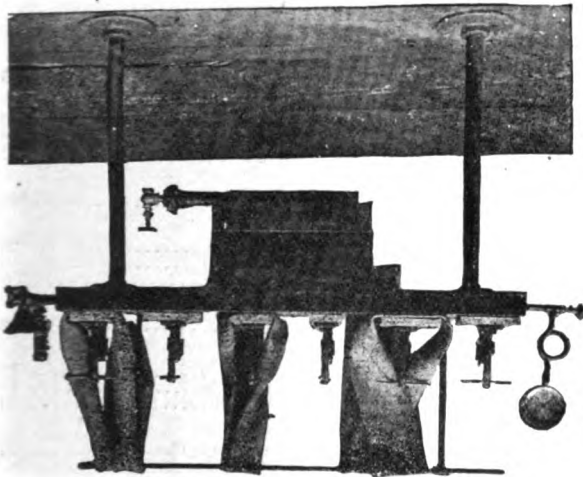
Skinner & Skinner Company. - 1718 Michigan Avenue, Chicago, Ill.

New No. 9 Inner Tube Vulcanizer.

We illustrate herewith the new No. 9 Inner Tube Vulcanizer, which has just been put on the market by the Auto Tire Vulcanizing Co. of Lowell, Mass. This vulcanizer is made in three sizes,

tached to any electric current. The manufacturers claim that the heating elements are equally efficient on either direct or alternating currents and it can be used by any one, where there is electricity. A special tip is made with each

their Alco German Lava Burners. Dealers everywhere who are not handling these goods should write for one of these catalogues. The introductory article entitled "Ask Bill" is worth paying for on the part of any business man. The



Inner Tube Vulcanizer.

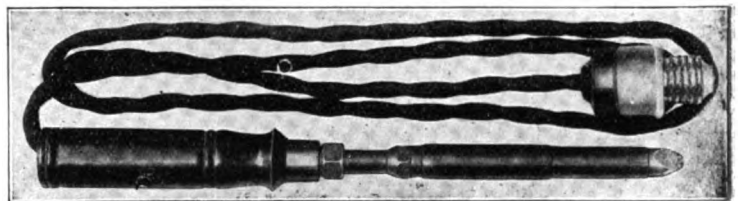
to cure 6, 9 or 12 tubes at one time. It can be fitted to generate its own steam for 6 tubes as shown in the cut and can be furnished for 9 or 12 tubes, to connect direct with steam boiler. Write for full information, prices, etc., to the Auto Tire Vulcanizer Co., Lowell, Mass., and mention this journal. The same company makes a complete line of vulcanizers, cases, kettles, coils and other conveniences for tire repair work.

Do Your Own Soldering By Electricity.

The accompanying illustration in an electric soldering iron, which can be at-

iron to fit any automobile radiator. This tip saves a great deal of time in repair work. These electric soldering irons are simple in construction and substantially made. The heat is constant always at the point. The handle in adjustable, affording a long or short reach. The manufacturers will send you full particulars. Address the Nilson-Dillenberg Co., 135 Adams street, Chicago, Ill.

Alco German Lava Burners.—We have received from the American Lava Company of Chattanooga, Tenn., a very handsome booklet profusely illustrated giving full particulars with respect to



New Electric Soldering Iron.

American Lava Company has grown from nothing to one of the largest businesses in the country inside of 12 years. We understand that this is the first gas burner catalogue ever issued by any company. This company makes either here or abroad every shape, size and kind of an acetylene burner. The classifications of burners in the catalogue makes it especially easy for prospective buyers.

L. F. Hussey, formerly manager of the Publicity Department of Wells Bros. Company, Greenfield, Mass., has recently accepted the position of Advertising Manager for the Standard Tool Company of Cleveland, Ohio. Mr. Hussey is well equipped for the duties of his new position, and he has our best wishes for his success.

Geo. A. Haws, manufacturer of Panhard oils and greases, has opened a branch at 899 Boylston street, Boston, Mass. A. H. McIntyre who is well known to the trade will be in charge of this branch.

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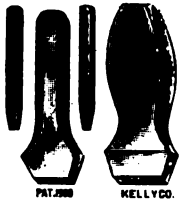
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Please mention the Automobile Dealer and Repairer when writing to advertisers.

Steel Stamps.

The accompanying illustration shows a steel stamp which is being placed on the market by the manufacturers, for stamping all kinds of tools, etc. These stamps are used by mechanics and machinists, and by the trade in general where the stamping of trade marks, initials or emblem letters or figures is required. These stamps are said to be made by the best workmanship and of the best material. The firm making them is reliable and likewise deals in a full line of stamps of any description. By writing to the manufacturers, Fred C. Kautz & Co., 2633 Lake street, Chicago, Ill., they will send you a catalogue and price list. Kindly mention this journal.



Steel Stamps made by Kautz & Co., 2633 Lake Street, Chicago, Ill.

ials or emblem letters or figures is required. These stamps are said to be made by the best workmanship and of the best material. The firm making them is reliable and likewise deals in a full line of stamps of any description. By writing to the manufacturers, Fred C. Kautz & Co., 2633 Lake street, Chicago, Ill., they will send you a catalogue and price list. Kindly mention this journal.

The Rex Spark Plug.

A new spark plug, which has just been placed on the market is called the "Rex" and the manufacturers claim that this name is highly appropriate, on the ground that this is really "the king of plugs." Some of the advantages claimed for this plug are its simple construction, "hot spark absolute" and no short circuit. The plug is guaranteed to be soot proof. It has an interchangeable porcelain which is of the finest material and guaranteed to withstand the heat. The electrode has the meteor wire which cannot burn out. This plug is made in all standard sizes, metric, half inch, A. L. A. M. and motorcycle. It retails regularly for \$1.00, but the manufacturers are making in this issue a special introductory offer to readers of this magazine. They will send a set of four plugs for \$2.00, which is just half price, if you will cut out a coupon attached to their advertisement this month, and send it in with the cash. In ordering from this coupon, be sure to state the size of thread desired and the name of your car.



Rex Spark Plug. Manufactured by the Rex Ignition Mfg. Co., 1779 Broadway, New York City.

As this offer is only made for a limited period, we advise our readers to take advantage of it promptly. Address all communications to the Rex Ignition Mfg. Company, 1779 Broadway, New York City and mention this magazine.

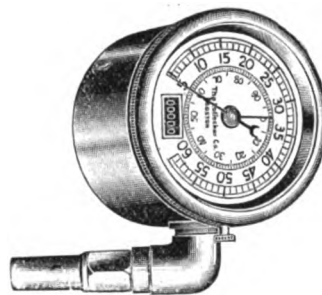
The Pitless Auto Turntable Company of Kansas City, Missouri, have recently established agencies in New York, Chicago and Buffalo. Richard Everett and Richard Thompson are in charge of the

New York agency at 57 East 125th street. William Kennedy is in charge of the Chicago agency at 193 Michigan avenue, while Werrick Brothers have the Buffalo agency at 637 Main street.

Thomas Auxiliary Springs.—The Thomas Auxiliary Spring Co., Canisteo, N. Y., have an announcement in this issue directing attention to the economy and comfort in using their springs. They claim these springs make a car ride like a Pullman. Write to them for further particulars and prices.

A Good Speedometer.

The Hoeffcker Speedometer was placed upon the market five years ago. It has had a very successful career. The feature of accuracy is obtained somewhat differently from the ordinary way. Each dial has an individual calibration of its own. It is claimed the absolute accuracy cannot be obtained by any other method. The trip device is wholly a Hoeffcker feature. Road book users have found this to be indispensable in determining intermediate distances. The line for 1911 will embody many new and attractive improvements. This company has also brought out a new \$50 model. They also have a new strain proof, non-breakable flexible casing, something which is entirely new along this line, and is the result of fifteen years' experience by those who have made a special study of it. The main office of the Hoeffcker Speedometer Co. is at Motor Mart, Boston; and B. M. Asch & Co., 1779 Broadway, are the New York City selling agents. Correspondence is invited. In writing mention this magazine.



The Hoeffcker Speedometer.

"Rain Vision" Wind Shields.—By means of special friction hinges, the upper half of either the "Milwaukee Adjustable" or "Clear Vision" shields may be tilted outward or inward at any angle to afford an opening through which the driver can have an unobstructed view when the glass is covered with rain or snow and at the same time be protected. These shields are manufactured by the Garage Equipment Mfg. Company, Milwaukee, Wisconsin.

Four Big Tire Companies in One.—On another page will be found the announcement of the United States Tire Company, 58th street and Broadway, New York, giving particulars of the consolidation of the Continental, G & J, Hartford and Morgan and Wright Companies into one huge selling organization, The United States Tire Company. It is said that the sale policy and the facilities of the new organization mean speedier and more satisfactory handling of orders, than would be possible with a smaller organization. Dealers everywhere not handling tires made by this company are requested to write for particulars and special terms.

"Triumph Leather Varnish."—The Novus Homo Manufacturing Company of Milwaukee, Wisconsin, have an announcement in our advertising department of their "Triumph Leather Varnish." They say if the seats of your car are worn or lose their nice black finish, that a little of their varnish will make them look like new. It is also a leather preserver and it is said to prevent leather from cracking. It may be used on the leather of furniture, or harnesses or leather tops, but consult the advertisement and write for further particulars, mentioning The Automobile Dealer and Repairer.

Specialties.—Frank W. Morse, 516 Atlantic avenue, Boston, Mass., wishes our readers to note the following specialties that he has recently brought out. Style "R.R.", hard rubber connectors. These require no soldering or set screws. Style "Q" a switch. This he says is the smallest closed lever switch in the market. It is made of hard rubber. Style "M" push button with other points of superiority. The last is made of hard rubber with rounded ends and it is thoroughly insulated, but write to him for his catalogue, which will give you full particulars.

The Tire Record Book.—The Empire Tire Company of Trenton, New Jersey, has recently brought out a very valuable little book for motorists, with specially prepared pages for keeping a record of tires used, so that one can see just how much mileage they get out of every tire. They say that very few automobilists get more than seventy-five per cent. of the service out of tires that they ought to get, for the simple reason that most people abuse their tires shamefully, however painstaking they may be with the balance of their car. But send for this little book; it may be worth dollars to you.

The Champion Spark Plug.—This plug is made by The Champion Spark Plug Company, 615 Jefferson avenue, Toledo, Ohio. See their advertisement on another page and in writing for further particulars or ordering mention The Automobile Dealer and Repairer. They also manufacture the "Misskip Detector," which can be used by anybody and will easily locate any trouble in connection with a spark plug. It is instantly attachable to any make of spark plugs. Prices are given in their advertisement.

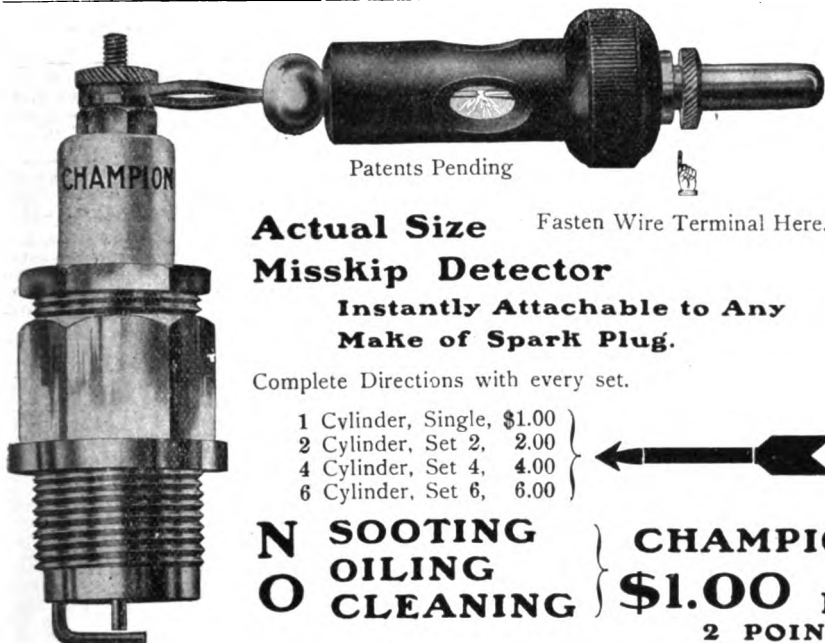
Keystone Grease.—For the first time, the Keystone Lubricating Company of Philadelphia, Pa., with numerous branches as will be seen in their advertisement on another page, come before our readers with a brief description of their celebrated Keystone Grease. Their advertisement contains an important guarantee. But consult it and get this grease from your dealer. It is said a trial will convince any one of its merits.

The C. W. Kelsey Mfg. Company of Hartford, Connecticut, manufacturers of the Motorette, have just closed a special exhibit in Philadelphia. The Motorette was first brought to the attention of the general public at the Grand Central Palace Automobile Show in New York City, and the experience there and in Philadelphia would seem to indicate that there is a vast field for this car.

Ideal Shock Absorber.—This device is manufactured by C. L. Thomas, Canisteo, N. Y. It is said to be easily attached and to be noiseless, but consult his advertisement and write to him for further particulars.

MISS! SKIP!

chug! chug!—(Miss)—chug!—(Skip)—chug!—(Miss-skip)—chug! chug! chug!



Patents Pending

Actual Size Fasten Wire Terminal Here.

Misskip Detector

Instantly Attachable to Any
Make of Spark Plug.

Complete Directions with every set.

- | | |
|---------------------|--------|
| 1 Cylinder, Single, | \$1.00 |
| 2 Cylinder, Set 2, | 2.00 |
| 4 Cylinder, Set 4, | 4.00 |
| 6 Cylinder, Set 6, | 6.00 |



GET A SET TODAY

N SOOTING
O OILING
O CLEANING

CHAMPION SPARK PLUGS

ALL SIZES.

\$1.00 PORCELAIN and MICA.
2 POINT MAGNETO, \$1.25

Write us now, enclosing your order, remittance, and your dealer's name. Don't delay! We will ship your order postpaid, at once, on receipt.

THE CHAMPION SPARK PLUG CO., 615 Jeff. Ave., Toledo, Ohio.

ONE ONLY SENT FREE TO EVERY MOTOR CAR OWNER



Our new **money saving** catalog No. 26, the latest, complete and most comprehensive book on auto supplies ever issued. Not only does it contain every accessory of merit at the lowest possible price, but the new revised state auto laws, the international rules of the road, and numerous helpful repair hints that will be as interesting to the amateur driver as to the experienced motorist. These hints will save you hundreds of dollars yearly. **Remember** it's **ALL** in our big book and it's **FREE**. Ask for it **NOW—AT ONCE**.

35% AUTOMOBILE SUPPLY CO.,

A. B. NORWALK, Pres.

New York,
1783-5 Broadway at 58th St.

Main Offices,
97 Chambers St., N. Y.

Chicago, Ill.,
1508 Michigan Ave.



Now Touch Up the Car.

Autolac is a new accessory which should appeal to every owner and garage. To-day many cars are in need of either a complete refinishing or a touch-



ing up of mud guards, fenders and other exposed parts. The owners are in many cases deterred on account of the delay and expense involved. Autolac eliminates these objections, since it can be applied by any one with a brush or cheesecloth. It dries overnight, with a

smooth, durable and brilliant finish and it is claimed that it will not discolor from mud and water. The manufacturers have had it under test since last July and claim that they have not had a single complaint. It should open a profitable business to the garage. The details will be given to any interested party upon request. One quart will refinish the average car. Prices: Gallons \$5.00; halves \$2.75; quarts \$1.50. Liberal trade discounts are allowed in quantity. Autolac is being sold by the Autolac Mfg. Co. of Cleveland, Ohio.

A Perfect Pump.—The Hawthorne four-cylinder automobile hand pump is clamped to the running board of the car. This feature insures stability. With the ordinary piston pump the operator has difficulty in preventing the

pump from "walking" all over the ground and frequently it is hard to find an even space that will allow its use. Having a rotary movement and being geared a child can operate it even after high pressures have been placed in the tires. It is claimed that it will give a greater pressure with less exertion than any other hand pump. Every pump is carefully tested to 100 lbs. pressure and will pump higher pressures if necessary. It is made of the best materials available for the purpose and is simple in its mechanical construction, insuring great durability. In fact no one can want or ask a more compact, powerful or quicker working pump. The price is low. For full information, write the manufacturers, the Hawthorne Mfg. Co., 7 Spruce street, Bridgeport, Conn.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of three cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 50 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, NEW YORK.

AUTOMOBILE INSTRUCTION.—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. \$22 West 57th St., N. Y. City.

SEND US YOUR BROKEN CYLINDERS,

and crankcases to be welded at less than one-quarter the cost of new ones. Work absolutely guaranteed. Pay only after testing. Write for references and prices. Waterbury Welding Works, Waterbury, Conn.

TOPS—Until further notice, runabout top \$20, touring car tops \$35. C. G. Meyer & Son, Tiffin, Ohio.

ATTENTION.—Two gentlemen's broadcloth overcoats, lined throughout with Canadian mink; beautiful Persian lamb collars; sizes 38-40 and 42-44; cost \$200 each in Canada; were never worn; sacrifice \$35 each; two elegant cinnamon bear robes, value \$175; sell the pair \$30; also handsome lady's long fur coat, satin lined, size 36-38, cost \$150; sacrifice \$35; like new. Call or write E. Roberts, 104 West 114th St., New York City.

FOR SALE.—New folding wind-shields, complete with brass rods and fittings, each \$12.50. Touring bodies, painted and upholstered, will fit any standard chassis, \$75.00. Slightly soiled 34x4 Hartford Dunlop casings, run less than 50 miles, \$25.00. New radiators and hoods, 22-25 h.p. (blue print on application), \$22.50. Mufflers, all styles, \$4.00. Shaft drive rear axles, made by the American Ball Bearing Axle Co., complete with brakes, brake drums, hubs, hub caps, etc., \$90.00. Tubular axles, complete, \$22.50. Single chain drive rear axle, \$15.00. We ship any of these c.o.d. with privilege of examination if a deposit sufficient to cover transportation charges both ways accompanies the order. Send for Bulletin No. 8. Automobile Appliance Co., 1714 Michigan Ave., Chicago, Ill.

AUTOMOBILE REPAIR PARTS.—Send us your broken parts and we will repair or duplicate them no matter what they are. We have the largest and most modern equipped plant in the country for that class of work and guarantee prompt and satisfactory service at reasonable prices. The Adapt Machinery Co., 1626 Wabash Ave., Chicago, Ill.

CELLULOSIA BEST SUBSTITUTE FOR glass used in automobile and buggy storm fronts, side curtains, etc. Sheet, 30x26 in., 88 cents; 12x20 in., 36 cents. Tail and side oil lamp covers 60 cents each, satisfaction guaranteed, postpaid. Hawes Storm Front Co., Coldwater, Mich.

PATENTS SECURED.—C. L. Parker, patent attorney, ex-examiner Patent Office, 962 G Street, Washington, D. C. Inventor's handbook upon request.

AUTO TIRES—GUARANTEED.—We sell direct to the consumer. No discount to dealers. Money saved is money earned.

22 x 3	.....\$10.00	34 x 3 1/2	.....\$12.20
20 x 3	.....11.00	34 x 4	.....15.00
20 x 3 1/2	.....12.50	34 x 4 1/2	.....19.00
20 x 4	.....14.00	36 x 4	.....15.00
22 x 3 1/2	.....12.50	36 x 4 1/2	.....20.50
22 x 4	.....14.00	36 x 5	.....25.00

New tubes at bargain prices. 10 per cent. deposit required with C. O. D. orders. Batcheller Rubber Mfg. Co., Inc., 183 Hudson St., New York City.

PERFECTION QUICK REPAIR PATCHES. For inner tubes. Simply moisten with gasoline and stick on. Send 75c. for box of samples. Agents wanted. Write for terms. Central Penna Auto Co., Harrisburg, Pa.

STEAM CAR CORRESPONDENCE SCHOOL. Finely written and illustrated course. Only school in world. Circular sent. 520 Fourteenth Street, Denver, Col.

AUTOMOBILE RADIATORS repaired at a reasonable figure. First class work guaranteed. Ship your radiator and write us. Grand Haven Auto Body Company, Grand Haven, Mich.

Broken Crankshafts, Crankcases, Gears,

Flywheels, Welded. Pay after you test them. Broken cylinders made new \$3.25. Atlas Welding Works, Rahway, N. J.

FORD OWNERS.—Drop us a postal for our catalog. It will save you money. Auto Parts Co., Providence, R. I.

SAVE the pieces. Broken cylinders, crank cases, shafts, gears and housings promptly repaired just like new at one-third cost and guaranteed. Address Welding Department, Bertschy Motor Company, Council Bluffs, Iowa.

HUPMOBILE OWNERS.—We furnish Schbler Model L carburetors with special manifold, hot air connections, and all attachments to fit your car. Can be attached in ten minutes. No more carburetor trouble. Guaranteed satisfactory or money refunded. Price \$25, express prepaid. Reference, Bank of Carthage. Butler Mfg. Co., Carthage, Ind.

20 FOOT MOTOR BOAT, THE BEST BOAT and engine outfit ever offered for \$275.00. Write now for descriptive booklet. Rice Brothers Company, Dept. I, East Boothbay, Maine.

1910 30-H.P. KISSEL 5-PASS. TOURING Car. Run 3,500 miles. Mohair top, gas and oil lamps, Prest-O-Lite tank, speedometer, windshield. Guaranteed perfect condition. Price \$1,200.00. Stone and Downey, 1905 Market St., Philadelphia, Pa.

AUTO TIRES REPAIRED AT LOW PRICES. Now is the time for you to get your tires repaired before the season opens up. Do not throw away your old tires. If the rims are good, send them to us and have them retreaded. We have facilities for doing the work properly. "Steam Vulcanizing." Prices are as follows:—Heavy double cover.

28x3	.....\$6.00	30x3	.....\$6.50
30x4	.....10.00	32x4	.....10.50
30x3 1/2	.....7.40	32x3 1/2	.....7.90
34x4	.....11.50	36x4	.....11.60
34x3 1/2	.....8.10	36x3 1/2	.....18.70
34x4 1/2 .....\$14.10			

Send them in at once. A retreaded tire when properly done is far superior to a new second. The Batcheller Rubber Mfg. Co., Inc., 182 Hudson St., New York City.

TWO cylinder Reo Touring car recently overhauled and in first-class condition. Price right for immediate sale. H. E. Burlingame, Box 1435, Providence, R. I.

A 40-H. P. New Ross Boiler, 26-Inch. and Burner; has copper shell, wire wound, and 1,030 copper tubes. Paid \$675, sell \$250. Money order or C.O.D. R. E. Caldwell, Beverly, Mass.

A NEW Blow-Out Patch, simple and effective; no lacing; sell set of three, one dollar; agents wanted. Crown Motor Supply Co., (Dept. F.), 3525 Broadway, New York.

FOR SALE cheap, five passenger 1909 Maxwell. More than fully equipped. Looks like and is as good as new. Extra casings and tubes. A great bargain \$775. Worth investigating. Address George Eberwine, Marblehead, Ohio.

MAKE YOUR OWN DRY BATTERIES. Instructions with blue print 25 cents. Renew dry batteries 20 cents. Stamps taken. Address Heco Electric Co., Box 988, Dallas, Texas.

WHITE STEAMER, five-passenger, Model H; large tube boiler; car just overhauled; practically new tires, windshield, top and speedometer. The car is guaranteed first-class condition. Has four inner tubes and all necessary tools. Will accept \$300 to move quickly. It is a bargain for someone. John Q. Hunsberger, Souderton, Pa.

AUTOMOBILES.—Mr. Consumer take notice—Buick five-passenger \$275. Cadillac five-passenger \$135. Lambert combination \$125. Eureka solid tire runabout \$100. Crest runabout \$75. Cadillac light delivery \$100. Knox light delivery \$100. Brand new Eureka solid tire high wheel runabout \$300. Elmore five-passenger \$375. Lambert five-passenger \$375. Apperson truck \$150. Box 54, Beavertown, Pa.

\$850.00 for 1910 model 20-24 H. P. Cameron, five passenger touring car, guaranteed in first-class shape. Complete with leather top, gas, latest Hartford shock absorbers, Woodworth treads, three new extra tires, Quick, detachable. Address Box 309, Columbus, Ga.

FOR SALE.—The finest equipped and most complete tire repair plant in the United States. Suitable for any form of automobile tire repairing including leather anti-skid treads, etc. Address Tires, 114 West 32nd St., New York City.

1000 guaranteed \$2.00 pocket Ammeters for testing batteries, beautifully nickelled, in chamolite leather case, 25 cents postpaid. Stamps taken. Electricians, 3525 Broadway, New York City.

FOR SALE.—"Steam Car Owners" Myers Kerosene Burner—Something new. Send for circular, 729 West Colfax, Denver, Colorado.

FOR SALE.—Good second-hand transmissions, motors, parts and fittings. Write for list and state what you want. Sallineville Model and Machine Works, Sallineville, Ohio.

SEATS.—Double Rumble Automobile Seats for Runabouts; size 40"x20 1/2" on bottom; back 19"; ironed and trimmed black leather, spring cushion, in priming coat, \$25; painted complete \$30 net cash. Prompt deliveries. Schubert Bros. Gear Co., Oneida, N. Y.

LEARN AT HOME, in a few evenings, how to construct, operate and repair Automobiles, Commercial Trucks, Flying Machines, Motorcycles, Motor Boats, Gasoline Engines, Electric Motors. Big demand, with good pay for competent men. Thousands of positions open. Let us help you in place and pay. A postal card will do. Address —EXTENSION DEPARTMENT, The Charles C. Thompson Co., 549 Wabash Ave., Chicago, Ill.

FOR SALE.—Four cylinder F. N. Motor-cycle all in running order to be sold cheap. A. Underwood, West Palmouth, Mass.

RADIATORS.

Their proper and expert repair is our business. No radiator is so badly damaged that we cannot save the owner greater part of cost of new one to replace it.

Quick, prompt service, satisfactory workmanship and a fair charge are the inducements for your patronage—it's producing results.

Manufacturers of the AERO cellular honeycomb type radiator. Fenders, Hoods, Tanks, Lamps and all sheet metal parts pertaining to the automobile, manufactured and repaired.

Aero Sheet Metal Works

1349 Wabash Ave.

Phone, Calumet 5352 CHICAGO, ILL.

Send for free sample of The Automobile Dealer and Repairer.

MOTOR VEHICLE PUBLISHING CO.,
24 Murray St., New York.

J-M Non-Burn Brake Lining.—The H. W. Johns-Manville Company, 100 William street, New York City, with 100 different branches (see announcement in this issue), make a brake lining which they say will enable the autoist to stop almost instantly, no matter how fast he may be going. As they state "Half the pleasure of automobiling is lost, when there is any doubt about the brakes being able to bring the car to a quick stop in case of emergency." It is plain enough that to avoid accidents, the motorist must be able to depend upon his brakes. They want every reader of this paper who may be interested in their J-M Non-Burn Brake Lining to write to the nearest branch office named in their advertisement for a little booklet explaining everything about this lining. This booklet is entitled "Practical Pointers on the Care of Automobile Brakes." In writing, please mention this paper.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Start Your Motoring Season Right!!

Enjoy your car to the utmost, this Spring and Summer by equipping it with

**NON-SKID
TIRES**

Firestone

**QUICK-DETACHABLE
DEMOUNTABLE RIMS**

ensure safety on slippery streets. The mass of angles, edges, hollows and sides hold your car safe as no other tire can.

Tougher rubber and more of it than on the tread of any other tire—more miles of wear—no metal studs to destroy the rubber—absolute safety from skid accident. All for only about 6% higher price than the regular Firestone tire.

After the non-skid lettering is worn down, you have a smooth tread left for summer use.

Can you afford the risk of not using Firestone Non-Skids?



Carry your spare tires inflated, ready to substitute, rim and all for injured tires without loss of time, hard work or pumping-up.

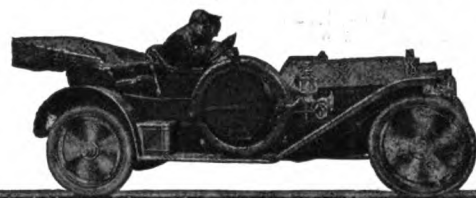
The Firestone Rim is designed and made by tire experts—it has no split base to admit moisture and ruin your tires. It saves your tires as well as your time and effort in changing them.

EQUIP RIGHT NOW with Firestone Demountable Rims, putting Non-Skids on the rear and saving your used tires for spares.

The Firestone Tire & Rubber Co.,
AKRON, OHIO.

"America's Largest Exclusive Tire and Rim Makers."

Branches, Agencies, and Dealers Everywhere.



For Car Owners and Garages.

Among the new articles brought out by the Dover Stamping & Mfg. Co., of Cambridge, Mass., that should have a wide sale are a strong five-gallon measure, guaranteed not to leak, and for use by gasoline dealers, a non-evaporating five-gallon gasoline measure, which is also useful for a storage can, a radiator filler with brass strainer that is absolutely rust proof, a tire testing tank for garage and vulcanizing use, and a great variety of gasoline measures for any

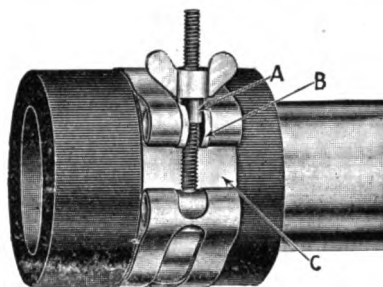


New Dover Tire Testing Tank.

purpose. The goods of this firm are of very high grade and they will last a greater number of years than most of the inferior goods with which the market is flooded, will last months. Send to the Dover Stamping & Mfg. Co., Cambridge, Mass., for their catalogue and prices.

The Catelain Clamp.

The accompanying illustration is the Catelain clamp, a new patented device just being placed on the market. The manufacturer claims nothing has ever been created in this line comparable to it. It can be attached or detached in a



New Hose Clamp.

few seconds. It cannot slip, loosen, or cut the hose, and its strength, owing to the construction of the band metal, is simply perfect. The manufacturer will send you one for inspection by writing A. C. Catelain, 1447 Indiana ave., Chicago, Ill., and mentioning The Automobile Dealer and Repairer.

The Empire Tire Company of Trenton, N. J., has appointed the F. P. Keenan Company of Portland, Oregon, agents for the sale of their tires in that city. Many of our readers can, no doubt, make it convenient to deal with this company.

The B. F. Goodrich Co., are making aeroplane tires, which would seem to indicate that air travel is on a pretty substantial foundation.

LEARN TO RUN & REPAIR AUTOMOBILES. YOU CAN.

ENGINE MODEL

THEY WORK

MAGNETO MODEL

THEY WORK

CARBURETTOR MODEL

THEY WORK

**It's Easy
WITH DYKE'S NEW SYSTEM**

I Will Teach You Right in Your Own Home, during spare time and quicker and more thorough than you could learn in years around a car—Because: in addition to Dyke's New Revised Home Study Course of 29 complete instructions (or 12 Books) and 120 Charts, we include absolutely free several

Working Models

of parts of the Automobile (see illustrations) for you to actually see the principle, construction and practice valve setting—timing ignition—setting the magneto, etc.

Harney Oldfield says—"A person surely can learn with your system."

10 Others Can Learn, You Can—We will send you testimonials from hundreds.

Ten Dollars Covers All—Others charge \$20 to \$30—and not near so complete—We send on approval—everything goes at one time—Diploma when you finish.

FREE: 24 Page Book—"How to get into the Auto Business"

Don't Miss It! Write Today!

DYKE'S COR'SP. SCHOOL MOTORING,
Box 9 —3947 Washington, ST. LOUIS

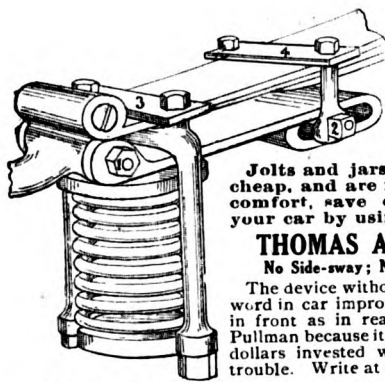
**MANIKIN
OF AN
AUTOMOBILE
TAKE IT APART.**

SEE HOW AN AUTO IS CONSTRUCTED.

"I am now driving 'Winton Six'—Do all my repair work—owe it to your course."—EDW. SANVER, Montclair, N. J.
"Am opening Garage and Repair Shop since taking your course."
—F. J. HARRY, Lewisburg, Ohio. Let us show you many others.

The Firestone Tire & Rubber Co. has issued a unique hanger called "The Chauffeur's New Moral Code." Better send for it. It costs nothing, and it is good for car drivers to see and learn by heart and ponder over. Address the Firestone Tire & Rubber Co., Akron, O.

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AUTOISTS! ATTENTION!

Jolts and jars make the best car seem cheap, and are no longer necessary. Have comfort, save expense, give new life to your car by using

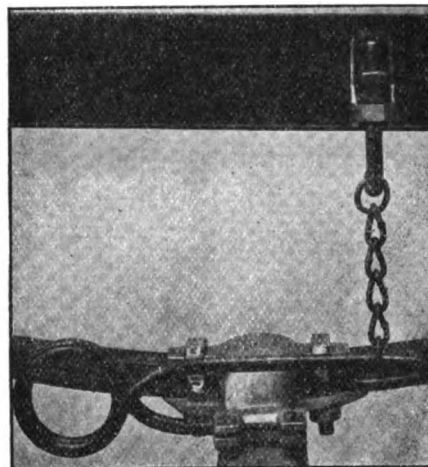
THOMAS AUXILIARY SPRINGS

No Side-sway; No Upthrow; Absorb all Shocks

The device without a rival, because it is the last word in car improvement and works just as well in front as in rear. Makes your car ride like a Pullman because it is the acme of flexibility. A few dollars invested will save you many dollars in trouble. Write at once for trial offer to

THOMAS AUXILIARY SPRING WORKS

CANISTEO, N. Y.



IDEAL

Shock Absorber

does the business to perfection, no parts to wear or need adjustment, perfectly noiseless, attaches readily to cars in general. Price is right.

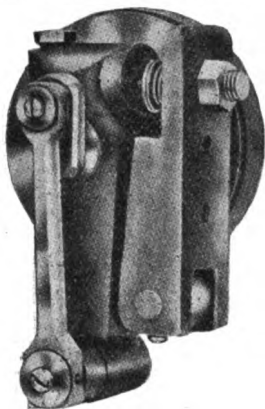
AGENTS AND JOBBERS WANTED

These can be carried in stock. Write for full description and trial offer.

C. L. THOMAS

CANISTEO, N. Y.

Hart Giant Pump



This pump is positively guaranteed for one year free from any defects and will pump 90 lbs. of air into a shoe in three minutes.

Pressure gauge goes with it.

Weight of complete pump only 10 lbs.

We want the privilege of giving every reader of this paper full particulars concerning our pump.

Write at once for descriptive circular and price.

ADDRESS

HART & WIDDER CO.

511 West 21st St., New York City
Telephone, 1687 Chelsia.

Motorists in New York are invited to call and have their tires inflated free of charge.

PRESERVE YOUR TIRES!

USE SLIKUP

N. B. ARNOLD

98 MONTAGUE ST. BROOKLYN, N. Y.

ONE HUNDRED DOLLARS REWARD

for Any Piece of Aluminum We Do Not Repair Satisfactorily. We will ship you on receipt of \$1.00, one stick of Solder with instructions for using. If not satisfactory, after trial, we will gladly refund the money.

Mass. Institute of Technology Tests on Soldered Joint 11,090 lbs. to Square Inch.

Solder for sale in large or small quantities.
ALUMINUM SOLDER CO. OF BOSTON, Inc.,
199 Berkeley Street. Boston, Mass.

H. PORTER K. PORTER EVERETT, MASS., U.S.A. BOLT CLIPPERS

THE GUS BALZER CO.
1777 Broadway, in the City of New York
MANUFACTURERS OF
Meritorious Automobile Specialties
Bouquet Holders, Trade Names, Monograms, Mirrors, Stevens Igniter, Stevens Carburetor, Radiator Cap Ornaments, License Plate Holders, License Plates, Lamp Numbers, Running Board Foot Scrapers, New Chauffeur's Badge Holder.

THE COLBY 40

(Develops Power of a "50")

A year ahead of them all in construction, value and price.

\$1750

Demountable Rims. Every part standard.

Write for liberal proposition to dealers.

Colby Motor Co., Mason City, Ia.

THE FAMOUS

Ronson Wrench \$1

At all Hardware and Accessory Stores

TIRE CHAINS WITH BONE HARDENED CROSS CHAINS

Whittaker Chain Tread Co.
Boston, Mass.

MOTORETTE

As well built as a \$6000 Automobile

Price \$385

Send for Catalog B

Dealers wanted. Guaranteed for one year.

C. W. KELSEY MFG. CO., Hartford, Ct., U. S. A.

The large addition to the factory of the Clarke Carter Automobile Company at Jackson, Mich., has been completed and the work of installing new machinery is in progress. With this new plant, the capacity of the company is increased four-fold, and every bit of this capacity we understand is needed to keep up with the demand for Cutting cars, especially the \$1,200 Torpedo Body Roadster, which has created a decided sensation. One of their Cutting cars has been entered for the great Indianapolis Sweepstakes race to be run on May 30th. On this same track last year a Cutting car made 200 miles in 183 minutes without a stop.

GASOLINE STORAGE UNDERGROUND OUTFITS

\$12.50, \$25.00, \$35.00 and up.

GOOD GOODS. LOW PRICES.

LUBRICATING OIL TANKS ALSO.

\$3.50, \$5.25, \$6.50, \$10.00 and up.

Cabinets, \$15.75 to \$100.00.

Oily Waste Cans, meeting insurance requirements.

Accurate Measures, and good funnels.

Kamp Kook's Kits that please tourists.

Ask Your Dealer. Send for Catalogue.

MANUFACTURERS SINCE 1889.

F. CORTEZ WILSON & CO.,

247 Lake Street, Chicago, Ill.

KENT'S BRAZING COMPOUND

With this, CAST IRON or STEEL of any size can be brazed by Brazing Torch or in a Blacksmith's Fire.

CIRCULAR FREE. Sample sufficient to braze 20 square inches mailed on receipt of one dollar.

S. W. KENT Cazenovia, N. Y.

Spencer Power Air Pumps

attached to any car

Radiators

Steering Gears

Steering Wheels

CENTAUR MOTOR CO.

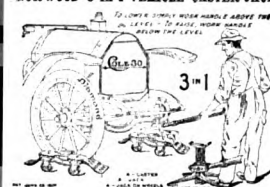
Detroit - - - Buffalo



ESTABLISHED 1873.
\$60 Lathe. Gap Lathes. Turret Engine Lathes and Shapers. Screw Cutting, Foot and Power Lathes, Hand and Power Planers, Hand and Power Drills, Chucks, Emery Wheels, Outfits. Tools especially for Blacksmiths, Electricians and Bicycle work. Catalogue Free.

SHEPARD LATHE CO.,
141 West 2d Street, Cincinnati, Ohio.

NORWOOD 3-in-1 VEHICLE CASTER JACK AND JACK ON WHEELS.



Automobile can be moved while on the jack. Frame one piece malleable iron; ball bearing casters delicately responding, permitting auto to be turned or moved easily in any direction.

Pat. June 25, 1907; Oct. 25, 1910. trade.

Write for descriptive circular

AUTO & ACCESSORIES MFG. CO.,
408 Continental Bldg., Baltimore, Md.

Subscribe to the "Automobile Dealer and Repairer," \$1.00 Per Year.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



**Our
New Non-Inflammable**

Will polish if metal is wet.
Will not settle. It's quick.
It will not leave a white deposit
or sediment.
It will not burn or explode.
It will polish hot metals.
Write for Free Sample
MANUFACTURED BY
The Harvey Chemical Co.
Dept. D,
Lafayette, Ind.

The Automobile as a Life Saver.

How an automobile saved a man's life, is a story told by S. T. Hill of the Swendeman Automobile Company of Helena, Mont. A crowbar had been driven through the body of the man in question. A Franklin car brought him from the ranch where he lived to Helena, a distance of sixty miles, where he secured the services of a surgeon. The man, who recovered from the injury, declares he owes his life to the automobile. The achievement of the car despite almost impassable roads won the admiration of the countryside, and the ranchers now declare they will have better roads. Said one, "Those roads might have cost the man his life."

"One afternoon," said Mr. Hill, in telling of the incident, "a doctor asked me to go up into the Augusta country, sixty miles away, to get a man who was sick at a ranch. I started out at five o'clock in the afternoon. When I was a little way out of Helena, I found the roads very bad; they were so heavy with gumbo that the tire chains frequently snapped. The wheels would spin around in the mud it was so deep. I was obliged to use up quite a section of a rancher's fence repairing the chains."

"When I reached Wolf Creek, thirty miles from Helena, a blizzard was raging. A man who was waiting for me there told me to follow a single telephone wire across the country and that at the third iron bridge a man would meet me with a lantern. I found the man with the lantern about four or five o'clock in the morning. I asked him where the ranch was. He pointed to the wire fence beside the road and said, 'This is it.'"

"Where is the house?" I replied.

"Oh, about twelve miles up the road," he said.

"When we reached the ranch house I found the rancher's son was not sick but seriously injured. He had been riding on the reach of the running gear of a lumber wagon. A crowbar was tied to the reach. The front end of the crowbar dropped down, struck the road and shot upward, severely injuring him. There was no one near to help him. He tried to ride home, but the rough roads threw him off, the team went on and left him, and he was obliged to walk."

"When the ranchers learned of the 120-mile trip the car made over their roads, they declared that they were going to fix them up. 'Suppose,' said one of them, 'I should want an automobile to come up for some one of my family, some night.'"

The gratitude of the young man's father was shown when he went to pay the bill. He considered the amount charged small. "I would have paid a thousand dollars," he said.

THE WONDER OF THE REPAIR SHOP

Tite-Wad is a putty-like substance composed chiefly of pure rubber. When applied to punctures, blow-outs, cuts, tears in the inner tube or rim-cuts, blisters or tears in the outer casing, it becomes immediately and permanently part of the original rubber. This gives the same results as vulcanizing. No tools needed but your hands. No experience or special skill.

"TITE-WAD"
"CAN'T TEAR IT OFF"

THE RUBBER PUTTY



PERMANENTLY REPAIRS ANY INJURY THAT CAN HAPPEN TO A TIRE.

Tite-Wad is not an experiment. We first made it for use in our own repair shops three years ago. During these three years we have put it to every conceivable test. We have repaired cuts and rips ten or twelve inches in length, butted ends together and then submitted tire to 90 pounds pressure without damage.

We are now offering Tite-Wad to the general market at \$2.00 per outfit. One Tite-Wad outfit will repair 40 or more punctures.

Tite-Wad is sold on an absolute guarantee of satisfaction or money refunded.

Our Plan will interest every live one. No exclusive for agency proposition. It is big enough for every-one. We bar no dealer. Write **Dealers** for prices and proof-patch and prove it to yourself.

PAGE-LESTER CO.

Dept. 3, 134 Van Buren Street

CHICAGO, ILL.

PAGE-LESTER CO., Dept. 3, 134 Van Buren St., Chicago.

I enclose \$2.00, for which please send me a complete Tite-Wad outfit, on your guarantee to refund my money if I am not fully satisfied with it.

NAME.....

ADDRESS.....

(If you are a dealer enclose your letter-head.)

Please mention the Automobile Dealer and Repairer when writing to advertisers.

GARAGE EQUIPMENT MFG. CO.

746 So. Pierce Street, Milwaukee, Wis.

MAKERS OF

The Famous "MILWAUKEE" Line of Automobile Accessories

High Grade in Quality, Workmanship and Finish. Ready Sellers. Trade Getters.

Write for our Complete Catalogue

"SUPERIOR" GRIP TIRE CHAINS

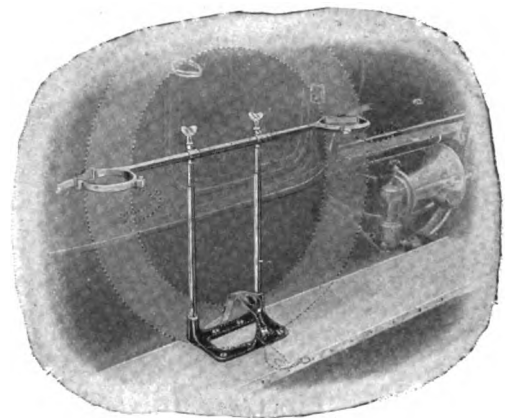


Do not confuse our chain with the ordinary chain with which the trade is familiar and which usually wears out in about thirty days if used on hard pavements. "Superior Grips" are superior to all others. They are SPECIAL HARDENED and will stand rough, hard usage.

Insist upon getting "SUPERIOR GRIPS" in light gray sacks.

FORE-DOOR Tire and Demountable Rim Holders.

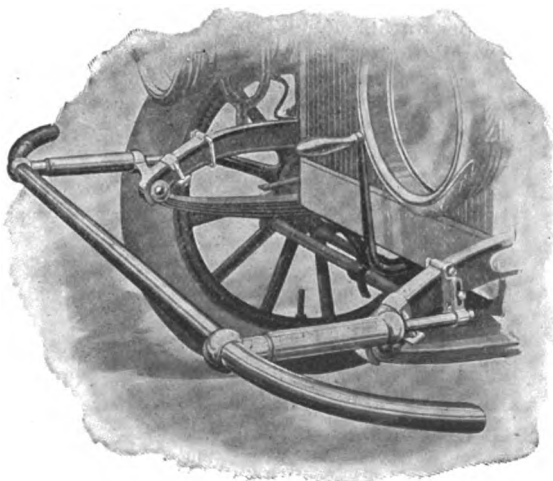
Fills a Long Felt Want.



Contained entirely on the running board. Therefore it is unnecessary to drill holes or otherwise disfigure the body of the car. Can be adjusted to fit any sized tire. Finished in brass or nickel. Made in two sizes.

"Protect your Lamps and Radiator."

The "UNIVERSAL" BUMPER



Will fit any car without drilling holes or removing bolts. Simply clamps to the frame. Strong, serviceable, ornamental. Finished in black, nickel or brass.

"MILWAUKEE" RAIN VISION WIND SHIELD

Can be placed in any position desired.

Strongly built.

Neat and attractive in appearance.

A credit to any car.

Several other styles.

The height of Wind Shield perfection.



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"BECCO" SPECIALTIES SAVE TROUBLE

Standard Terminal.

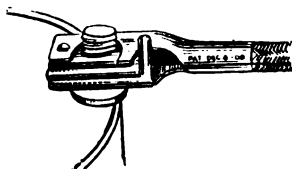


Instantly locates ignition troubles. Has a "sparking gap" (see cut) which makes it an ignition terminal and spark-tester combined. Can be used with about any spark plug, easily attached and detached. A little thing and inexpensive, but likely to earn its cost a thousand times over. Price, 15c Each.

Battery Connector.

It simply cannot break or work loose or go wrong. Every driver has known the annoyance connected with battery-connectors. This connector is a positive assurance against such annoyance.

Price, 10c Each.

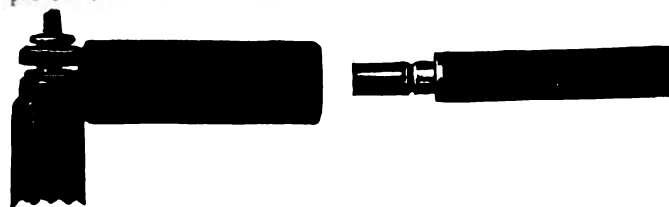


Wrench Set.



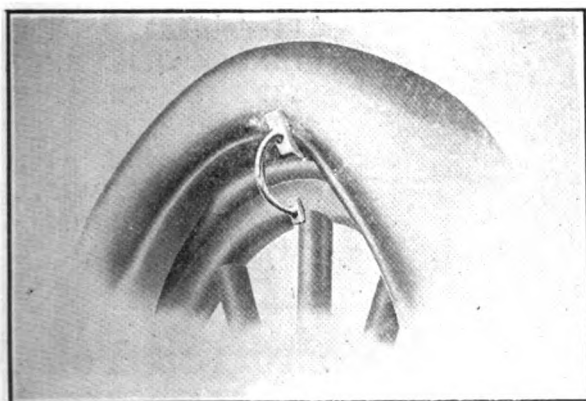
A unique combination tool for small bolts and nuts. Fits eight different sizes of nuts and also provides a screwdriver. Indispensable for the modern auto tool-box. Price, \$1.00 Each.

Special Terminal.



Has not only the "Sparking Gap" feature, but a "Cut-out," so that any cylinder can be electrically disconnected, without removing the terminal from spark-plug. All parts are insulated by means of a fibre sleeve. Impossible to receive an electrical shock, while manipulating. This is the last word in Sparking Terminals. Price, 35c Each.

Tire Grip.

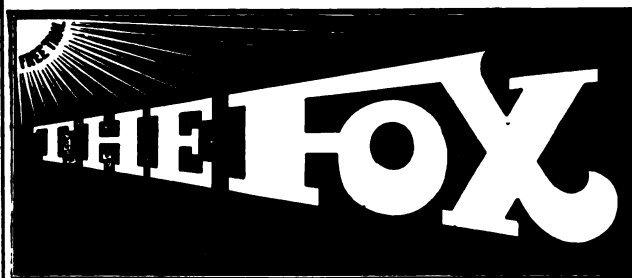


For use with Clincher Tires. It takes the place of a man. When you are putting on a tire, the lip of course has to be held in the rim of the wheel at one point, or the tire will keep creeping out as you work around to get it in. Ordinarily another man has to help with a tire iron to get the tire in place. Price, 50c Each.

If your dealer does not carry above specialties in stock, we will supply postpaid at the above prices.

Good Dealers Wanted As Agents.

THE BECK COMPANY, Rockville Centre, N. Y.



TO AUTOMOBILE DEALERS AND REPAIRERS

If you knew positively that by the persistent and judicious use of a typewriter you could in 1911 double your last year's business you wouldn't hesitate an instant in purchasing one!

We have just issued a large illustrated book showing how the big city concerns have built up their immense businesses and shows how anyone in any class of business can increase that business by means of the typewriter. There are hundreds—yes, thousands—of persons in your territory who are interested in Automobiles, and Automobile Supplies and Repairs, and these parties are going to purchase somewhere. Why not send to-day for this book and let me show you how the typewriter will enable you to get this business? It is Free!

WRITE FOR BOOK
SHOWING HOW
YOU CAN

Double
Your Sales
WITH A
TYPEWRITER



THE FOX—"THE ONE PERFECT VISIBLE TYPEWRITER"—FOR 20 CENTS A DAY! Sent on **FREE TRIAL** to anyone—anywhere—at my expense—to be returned if not better than the best of other makes. If purchased you can pay me a little down after trial and the balance at the rate of 20 cents a day—no payments on Sundays and Holidays.

The Fox is Visible—you do not have to look beneath a lot of moving typebars to see what is written! It has a Back Space Key, Tabulator, Two Color Ribbon with Automatic Movement and Removable Spools, Interchangeable Carriages and Platens, Card Holder, Stencil Cutting Device and Variable Line Spacer with Line Lock and Key Release. Its Speed is fast enough for the speediest operator or slow enough for the beginner. It is extremely Durable and almost Noiseless.

Will You Do This Now? I want you to fill out the attached coupon and give me a chance to "show you"—at my expense—what I have. Remember, I belong to no trust—no combination—and no one tells me at what price I must sell nor on what terms I must sell.

SEND FOR MY CATALOG, ANYWAY!

Date..... 191.....

W. R. FOX, President, Fox Typewriter Co.,
6604-6614 Front Street, Grand Rapids, Mich.

DEAR SIR:

Please send me a copy of your catalog and write me full particulars concerning your "20 cents a day" payment plan on the new Fox Visible Typewriter. It is distinctly understood that the signing of this coupon does not in any way obligate me to purchase, and that no typewriter is to be sent me unless I decide later to order one for free trial.

Name.....

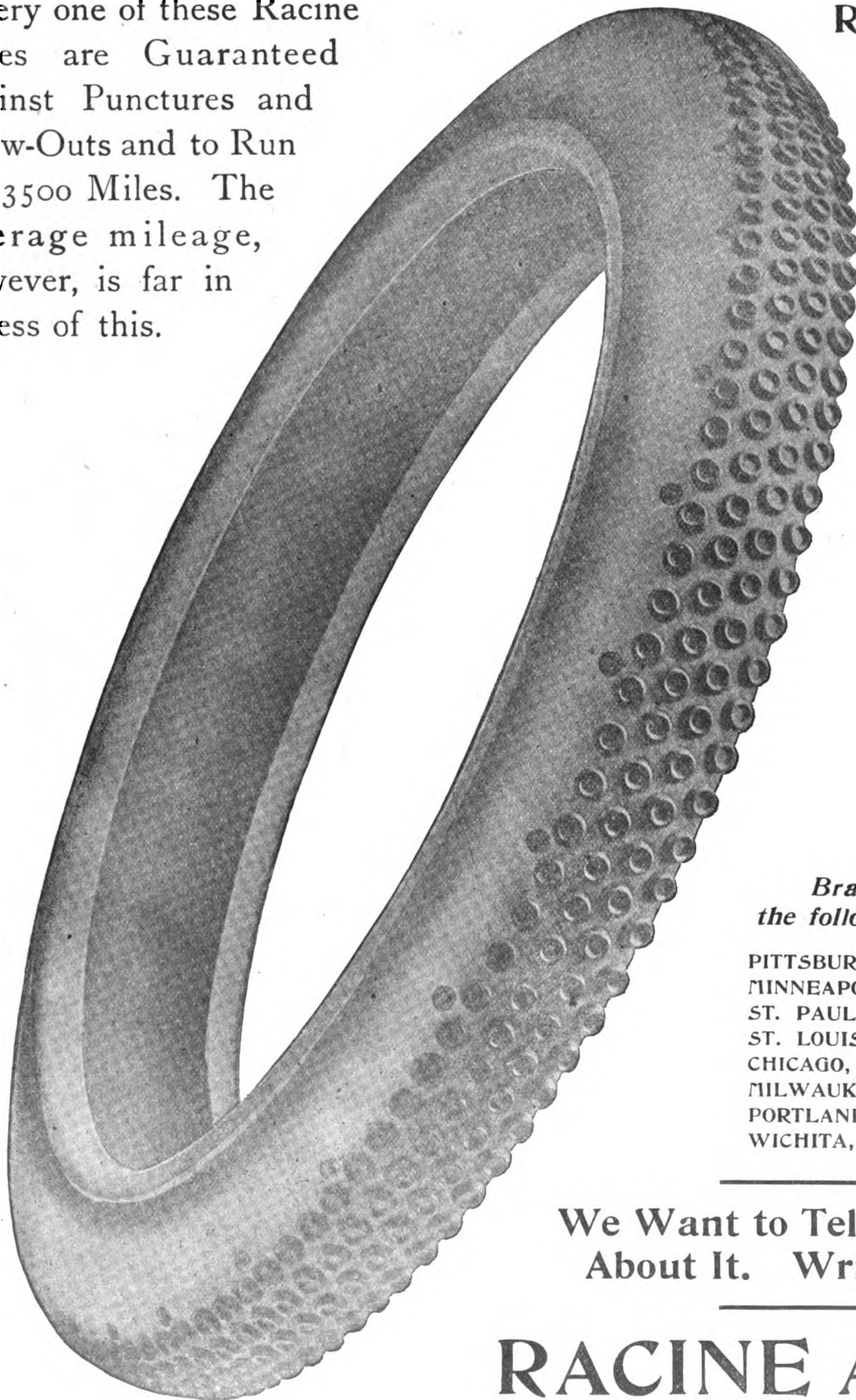
Address.....

Business.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

PUNCTURE PROOF A

Every one of these Racine Tires are Guaranteed against Punctures and Blow-Outs and to Run for 3500 Miles. The average mileage, however, is far in excess of this.



Resilient as Any Rubber Tire

The resiliency of the tire depends upon the volume of air confined and the pliability and elasticity of the material which confines it. Our tire is practically a rubber tire with a leather covering. The leather we use is as pliable and elastic as a rubber sheet of the same thickness and coupled with a rubber carcass gives you a quick and resilient tire.

Branches in the following Cities:

PITTSBURG, PA.
MINNEAPOLIS, MINN.
ST. PAUL, MINN.
ST. LOUIS, MO.
CHICAGO, ILL.
MILWAUKEE, WIS.
PORTLAND, ORE.
WICHITA, KAN.

**We Want to Tell You More
About It. Write Today**

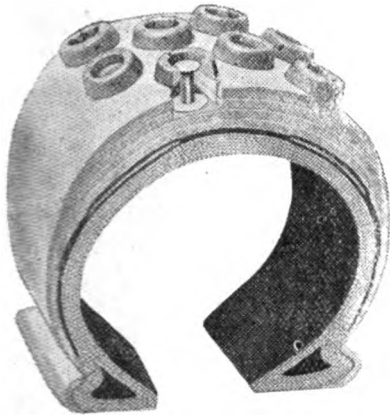
RACINE AUTO

Please mention the Automobile Dealer and Repairer when writing to advertisers.

AND BLOW-OUT PROOF

Construction of Tire

Racine Horse Shoe Tires are made by the celebrated Thropp wrapped tread open cure system. We pay a royalty on every tire made. This is acknowledged to be the best system and is used by the most successful of the rubber companies.



SECTIONAL CUT

The Horse Shoe Tire is built the same as the rubber tire up to the point of the tread stock of the best long strand $17\frac{1}{4}$ sea island cotton frictioned and skimmed with the best of gums. One more operation, or a rubber tread, would make it a rubber tire. We then **VULCANIZE** our specially constructed Chrome tanned leather cover, extending around and over the beads.

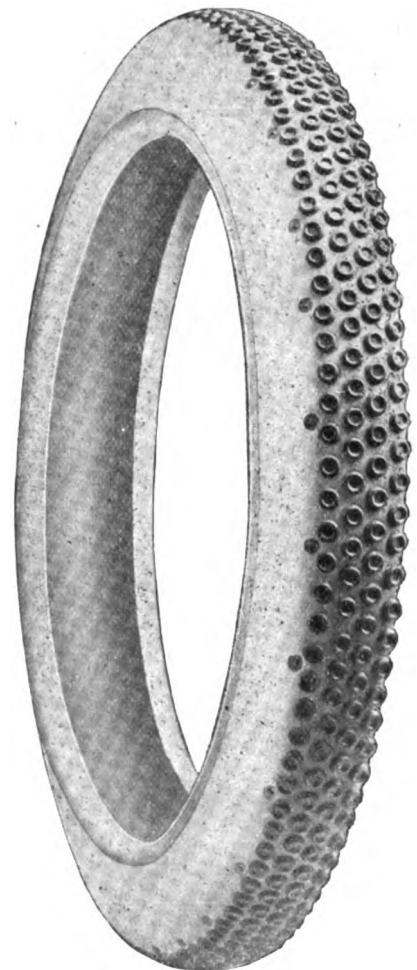
There are four thicknesses of leather at the tread, between each a skim coat of Pure Up River Fine Para and all securely vulcanized together. The rivets extend through two thicknesses and the two lower thicknesses are used for cushion stock to prevent any harm to the carcase.

The Racine Horse Shoe Tire is standard in every respect and will replace a rubber tire of the same size and type.

It is just as impossible to build a successful leather tire without vulcanizing as it would be to build a rubber tire by simply putting ply upon ply of rubberized fabric together without vulcanizing. The union that is caused between the plies of fabric and the leather and the fabric by solidifying the rubber or vulcanizing it, absolutely does away with all heating and stretching of the leather which is so common in loose covers.

SEND AT ONCE FOR
ILLUSTRATED CATALOGUE

TIRE CO., Racine, Wis.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

Cutting

A GREAT LINE FOR 1911

Watch the Other Manufacturers Copy Our Leader—the First Genuine Torpedo Roadster Ever Put On the American Market

We have told you in the past that this Roadster is the classiest, most beautiful, and smoothest running ever offered the public, regardless of price. To verify this statement, we want to say to you that one of our Agents in a city of not over 150,000 population, sold ten of these Roadsters in one day. At times, there were more than two hundred people standing by the machine inspecting the mechanism and beautiful lines.

It has been necessary to quadruple our estimated production for 1911.

The largest and most successful Automobile Distributors and Agents in the United States are to-day handling the CUTTING line of cars. Our complete line comprises everything that any human being could wish for in the shape of an Automobile at popular prices.

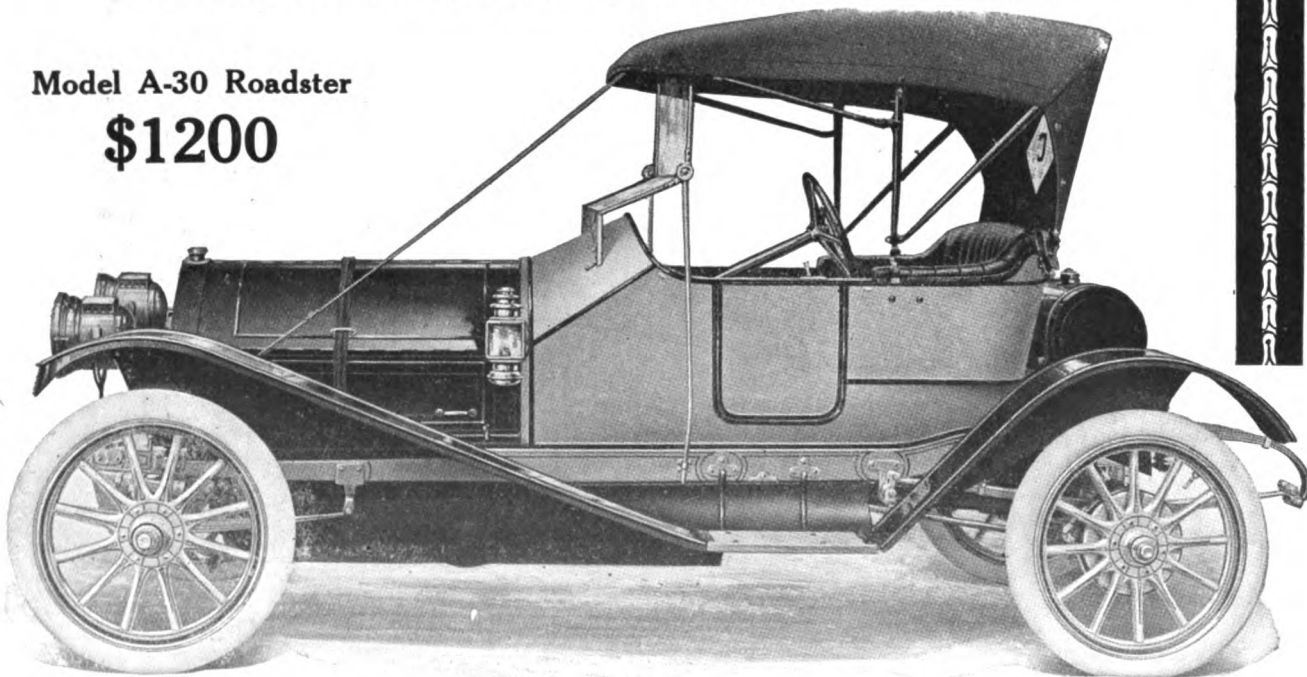
OUR COMPLETE LINE FOR 1911

Model	Wheel Base	Wheels	Tires	H. P.	Rims	Cylinders	Price
A-30 Roadster.....	116 in.	32 in.	32 x 3½ in.	30	Goodyear Q. D.	3½ x 5 in.	\$1200
B-40 Touring Car.....	116 in.	34 in.	34 x 3½ in.	35	Goodyear Q. D.	4½ x 4½ in.	1350
C-50 Touring Car.....	116 in.	36 in.	36 x 3½ in.	40	Demountable	4½ x 5 in.	1650
D-50 (Fore Doors) Touring Car.	116 in.	36 in.	36 x 3½ in.	40	Demountable	4½ x 5 in.	1700
E-50 Torpedo Body.....	116 in.	36 in.	36 x 3½ in.	40	Demountable	4½ x 5 in.	1750
F-60 (Fore Doors) Touring Car.	122 in.	36 in.	36 x 4 in.	60	Demountable	4½ x 5½ in.	2250
G-60 Torpedo Body.....	122 in.	36 in.	36 x 4 in.	60	Demountable	4½ x 5½ in.	2350

We have some good territory still open. Before closing elsewhere, write for Catalog and Specifications.

Model A-30 Roadster

\$1200



CLARKE-CARTER AUTOMOBILE CO., Jackson, Mich.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

All Roads Look Alike to Woodworth Treads

WOODWORTH TREADS ARE BEST.

BECAUSE they are held on the tires by coil springs that keep them always perfectly adjusted, preventing any danger of looseness, which causes chafing and heating of the tires.

BECAUSE they are made of treated leather which does not harden, crack or rot, like plain chrome leather used in other protectors, when subjected to the action of water and mud.

BECAUSE they have a newly designed rivet with heavier prongs than used by others, preventing any danger of the rivets being pulled out or loosened.

Besides these unmistakable advantages, **Woodworth Treads** are made from the most carefully selected materials by a firm with seven years' experience and with a reputation of always making right any goods of their manufacture which do not prove in use to be of perfect material throughout. Less than half the leather that is sent us by the tanners is good enough to use in **Woodworth Treads**. The Flanks, Bellies, Necks and Shoulders of the hides are trimmed off and used for making other goods where the quality of the leather is not so important.

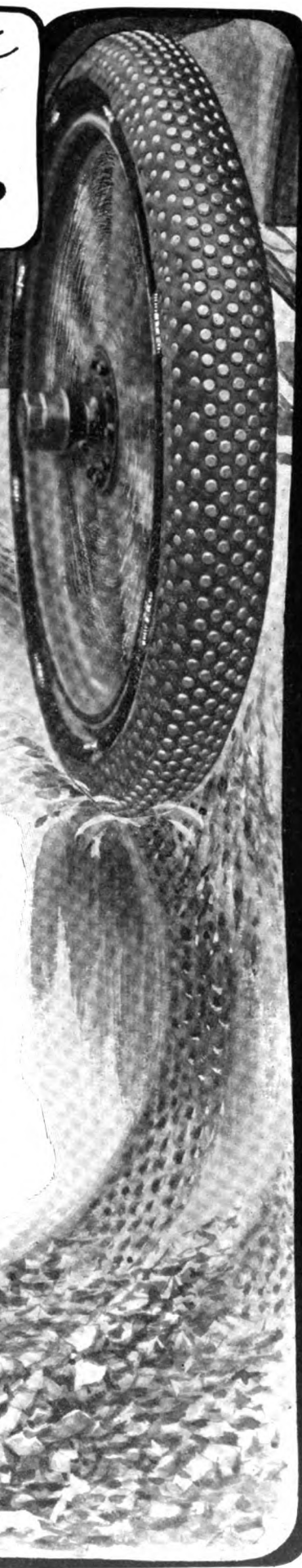
The design of the **Woodworth Tread** is the result of seven years' experience with tire protectors which have been sent to all parts of the world. When you buy **Woodworth Treads**, you can feel sure that they are so designed that they will give good results on any roads which you may encounter.

When **Woodworth Treads** were first put on the market, the only tire protectors in use were those held on the tire by fastening to the rim. The great advantage of the **Woodworth** method of fastening soon drove all competitors off the market and it was only when **Woodworth Treads** had demonstrated the great possibilities of tire protectors that imitators were able to bring out their inferior goods and supply them to people who had not known of the old type of protectors which had been displaced by **Woodworth Treads**. If you go to any of the old, reliable automobile supply houses that have had years of experience with supplies, any of them will tell you that **Woodworth Treads** are the **Only** treads on the market that they care to handle, because the makers of them can be depended on to supply first-class goods and to fully guarantee them.

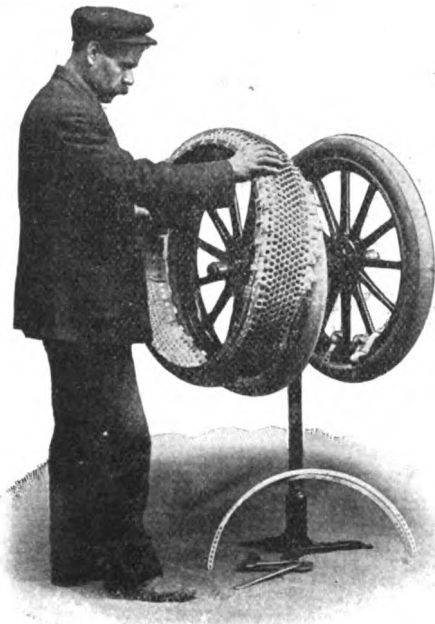
Do not be distracted by the advertising of the many imitators, but buy reliable, time tested treads and insure yourself against tire troubles, and obtain a reduction in tire cost.

Send for 1911 Catalog and free booklet, "The Preservation of Tires."

LEATHER TIRE GOODS COMPANY,
NIAGARA FALLS, N. Y.



JUST AS EASY



Placing tread over fully inflated tire by simply sliding the inside tension bands out of the closed loop hooks along tread margin

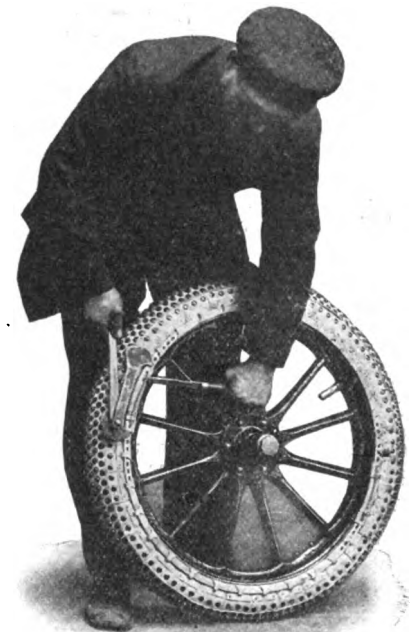
we want the stretch in the leather to come the long way of the strips as we cut them where it will cause the least trouble, and where it can be taken care of by the "UNIVERSAL" patented adjustment device, and this adjustment device isn't a so-called adjustment device by a long shot. It is ample; it's sufficient and it's efficient. It holds the

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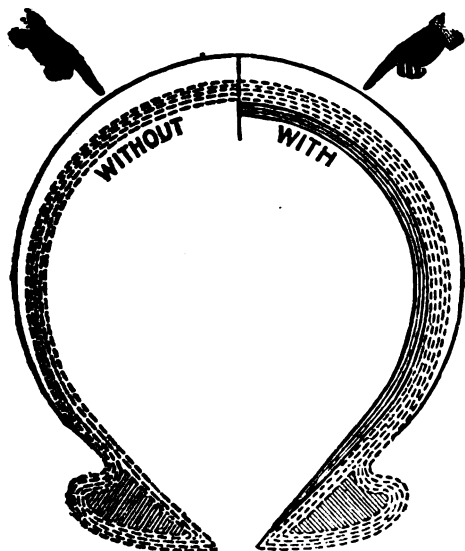
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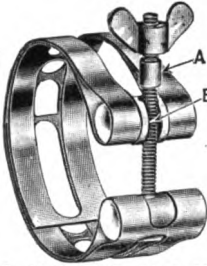
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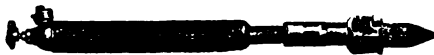
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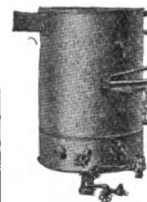
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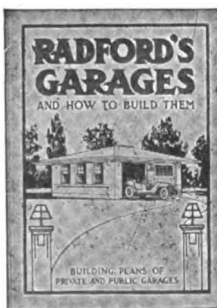
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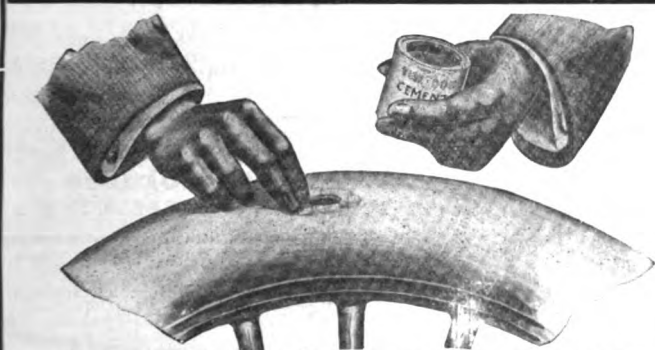
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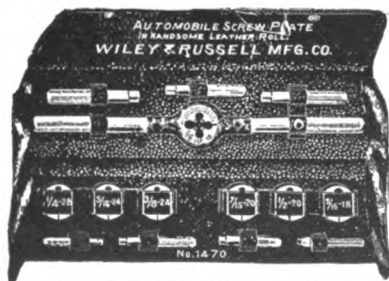
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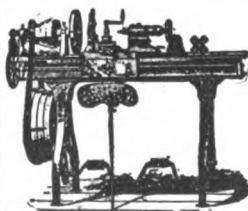
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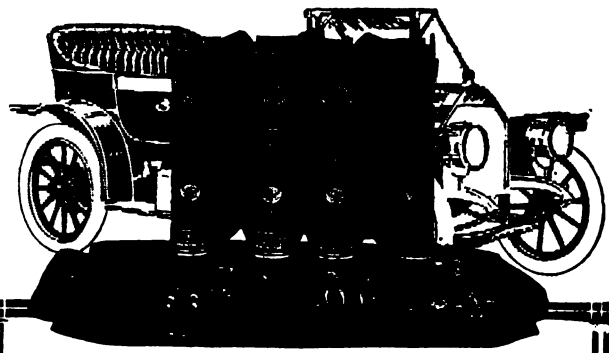
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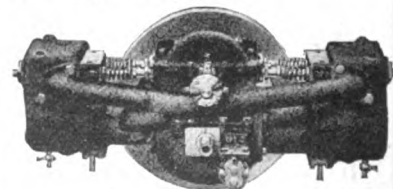
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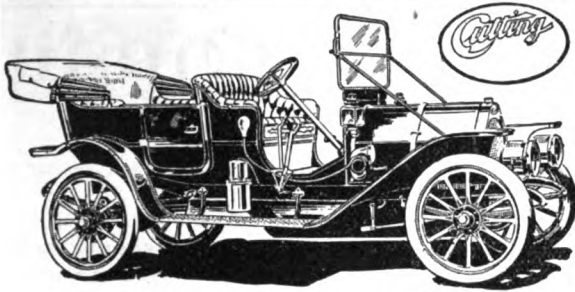
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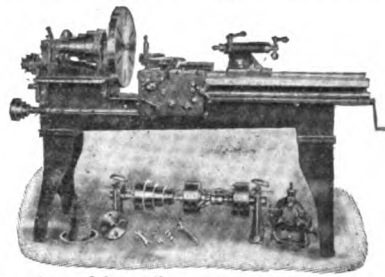
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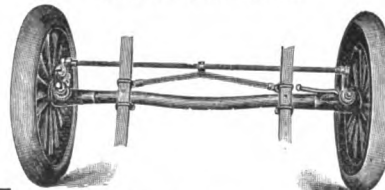
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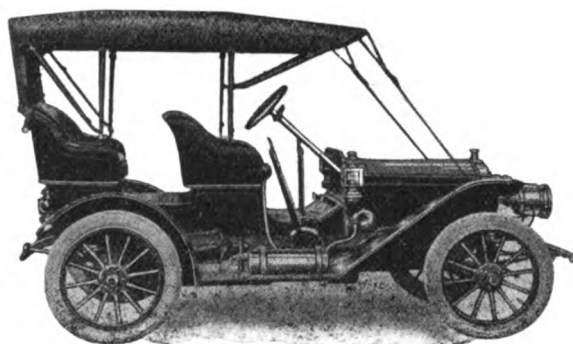
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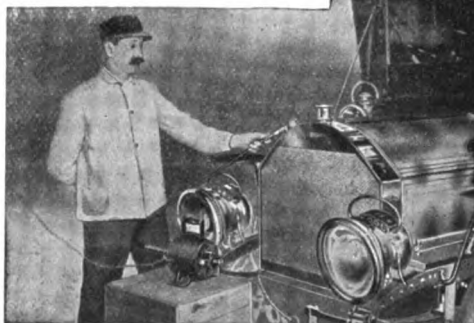
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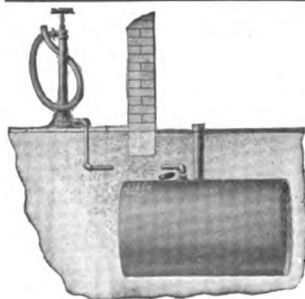
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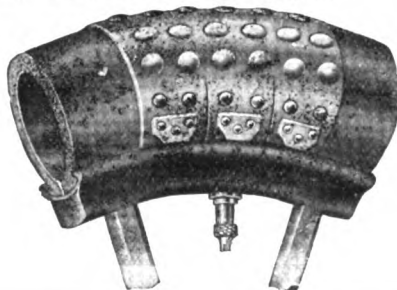
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We use the old casing as a foundation. After the old or loose rubber is removed this is covered by our vulcanizing compound. Then the whole is covered with tough wear-resisting French Chrome Leather. This adheres firmly to the old casing and the result is a tire that has the resilience of the pneumatic and the durability of the best quality leather.

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Steel studs on the tread make the tire puncture and skid proof, and the flat head rivets on the sides of the case as far down as the outer ply comes, protects the sides of the case against rut wear.

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Section of Tire Fitted with Triple Tread



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After



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Five years ago, When I Perfected My Tread, I Determined to Sell It Direct to Consumers, So That I Could Trace Results of Each Sale and Know for Myself Just What My Goods Were Doing. The Results of This Direct Selling

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Am Now Ready to Place "Bricton" Agencies With Leading Dealers Throughout the Country. Applications Will be Considered in Order of Receipt. Live Dealers, Who Want to Represent the

Only REAL Tire Protector Backed by the Greatest Advertising Campaign Ever Undertaken on a Similar Proposition, Should Get Busy and Wire, Write or Phone for Full Particulars of my Bricton Tread proposition At Once!

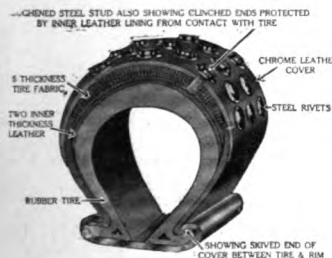
Bricton Detachable Tire Treads

"The Enemy Of Tire Expense"

Consider the following description of how this Tread is made:

First, I use an outer layer of specially tanned, extra pliable, Chrome Leather, which never becomes hard or brittle—never cracks—even when continuously exposed on the tire to all sorts of conditions—water, snow, sleet, dirt, etc. Next to the outer thickness of Chrome Leather are five layers—did you get that, "five layers"—of the very best quality tire fabric. I might use only three or four layers, and I might use a poorer quality of fabric, but my experience has proved that five layers are necessary to obtain perfect strength and in preventing the tread from stretching.

Next to these five layers of tire fabric is a layer of leather. Please note this: through the outer layer of Chrome Leather, then through the five layers of tire fabric are driven the steel studs and steel rivets. These are clinched into the layer of leather which immediately follows next to the tire fabric, and then there is yet another layer of leather which covers these clinched ends of rivets and studs and prevents them from coming in contact with the rubber tire. Consider, too, the method of fastening the Bricton Guaranteed Tread to the tire. The ends of the outer layer of Chrome Leather are



Cross Section of Bricton Tread

skived or sliced thin where they are placed between the rubber tire and rim. This does away with any possibility of thick ends which might crumple up, and makes possible a snug fit of the Bricton Tread over the rubber tire.

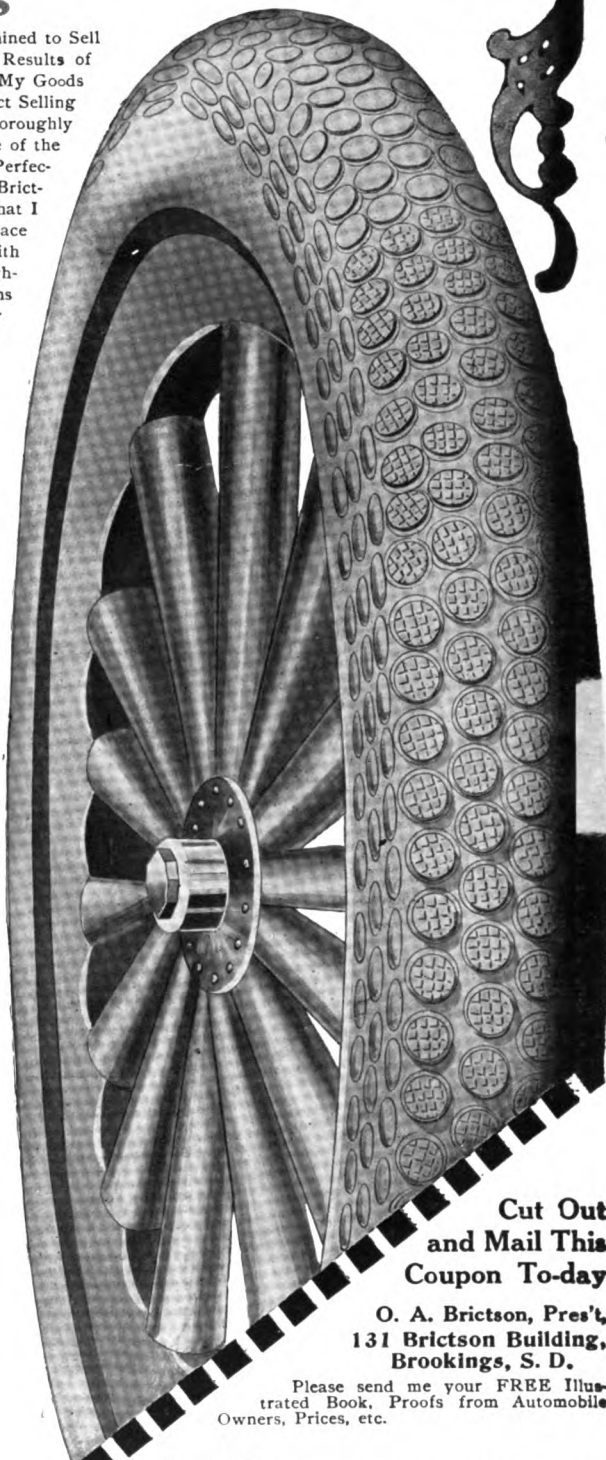
The Tread is slipped in place over the deflated tire and is not held to the tire or the rim by an artificial fastener, such as a hook, or buckle, a wire clasp, or anything of the sort. Air pressure between the tire and rim holds Tread to the tire after it is inflated. It is such construction as this that cuts your tire expense to a minimum.

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The demand for a carbureter in which the HOMO would be an integral part, has been so great, that the company has felt obliged to respond to that demand, and is, therefore, marketing the HOMO CARBURETER, which provides *an infinite number of jets* between closed and wide open needle valve, thus giving a different gasoline opening for every position of the throttle

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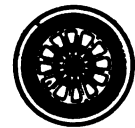
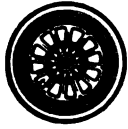
This mixture, already in far better condition for combustion than that produced by any other carbureter, then passes through the HOMO, where, by violent mechanical agitation, the gasoline is further disintegrated and diffused, and the air HOMO-geneously carbureted in the manner which has established the Homo as an essential adjunct to the power plant of the motor.

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Automobile Dealer and Repairer



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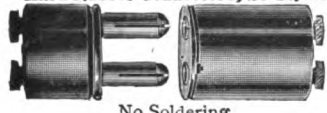
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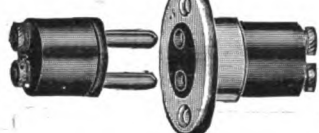
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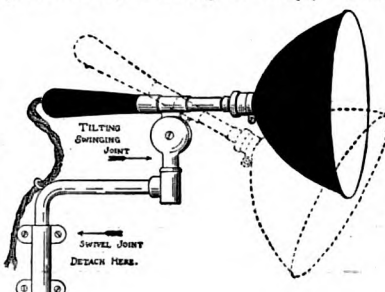
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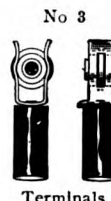
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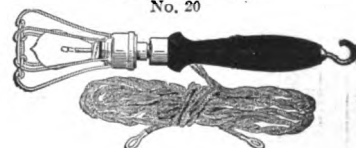
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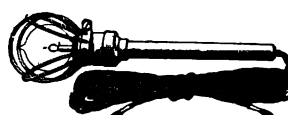
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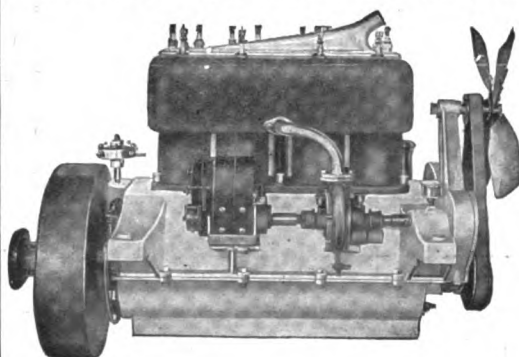


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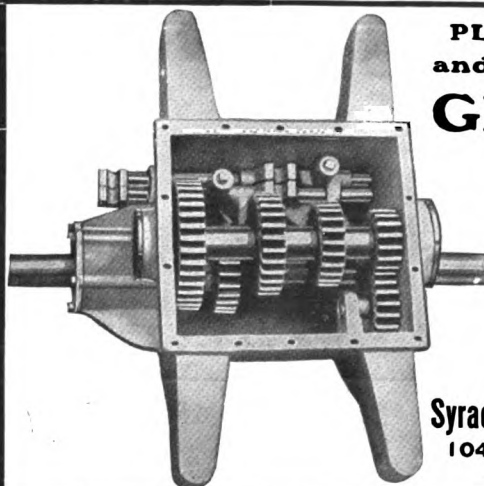


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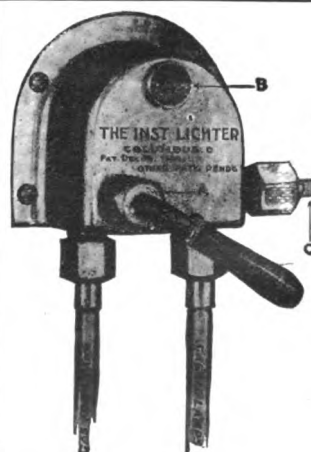
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Look through this list of articles carefully. You may buy as many as you please; your local Automobile Supply Dealers may carry some of these goods. Compare OUR PRICES with theirs and SEE HOW MUCH WE SAVE YOU.

Inside Tire Protector



This is made of several plies of fabric moulded to fit the inside of the casing all around so as to prevent tubes from being pinched in the fabric breaks. If you have a blowout in an old casing, put in an INSIDE TIRE PROTECTOR and continue to use it until wornout. If the blowout is very large

it can be reinforced with an extra Reinforced Blowout Patch at this point. In this manner the tires can be used until they are completely gone. The INSIDE TIRE PROTECTOR can be removed and used in other casings.

No.	Size	Reg. Price Each	Cut Price Each
9101	28x3 in.	\$6.00	\$2.70
9102	30x3 in.	6.45	2.92
9103	32x3 in.	6.65	3.13
9105	30x3 1/2 in.	7.15	3.37
9106	31x3 1/2 in.	7.20	3.45
9107	32x3 1/2 in.	7.25	3.52
9108	34x3 1/2 in.	7.35	3.75
9109	36x3 1/2 in.	7.50	4.05
9110	30x4 in.	8.00	4.12
9111	31x4 in.	8.20	4.27
9112	32x4 in.	8.30	4.35
9113	33x4 in.	8.40	4.42
9114	34x4 in.	8.50	4.50
9115	36x4 in.	8.75	4.65
9116	32x4 1/2 in.	9.00	4.80
9117	34x4 1/2 in.	9.25	4.95
9118	35x4 1/2 in.	9.75	5.05
9119	36x4 1/2 in.	10.00	5.10
9120	34x5 in.	11.50	5.40
9121	36x5 in.	13.00	5.82
9122	38x5 1/2 in.	13.50	6.00
9123	38x5 1/2 in.	14.25	6.75
9124	38x6 in.	15.00	7.13

"The Only" Blow-Out Patch.

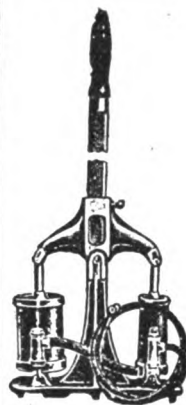


Made of vulcanized heavy tire fabric. Fits inside of outer casing perfectly. Flaps fit over rim and prevent creeping.

No.	Reg. Price	Cut Price
8100 For 2 1/2 or 3 in.		
8101 For 3 1/2 or 4 in.	\$1.00	\$0.40
8102 For 4 1/2 or 5 in.		

We consider this the best blowout patch bargain we have ever been able to offer. Out-classes all others at double the price.

If by Mail Add 9 Cents for Postage.



Oscillating Double Action Pump

A splendid pump for garage use and gives the completest satisfaction. The large cylinder pumps into the small one and the small one pumps the compressed air into the tire. It is one of the most powerful pumps on the market.

No. 8605 Without Gauge, Reg. Price, \$12.00 Cut Price, \$8.35

No. 8606 With Gauge, Reg. Price, \$15.00 Cut Price, \$9.35

Only Pump Connection

This connection will fit any valve, as a perfectly air tight connection is made instantly by simply pushing it on over the valve.

No. 8715 Reg. Price \$0.50. Cut Price \$0.09

If by Mail Add 2 Cents Postage.



Hundreds of other bargains are pictured in the

"FREE NATIONAL AUTO SUPPLY" CATALOGUE

Take advantage of the great variety we offer. Write for this beautiful illustrated Catalogue at once. Write to-day, it is yours for the asking

NATIONAL AUTO SUPPLY CO.

Dept. B, 77 Chambers St.
NEW YORK CITY



"The Only" Fill Gash

A rubber compound in a plastic form. It fills a cut perfectly, with very little shrinkage, and when dry forms a compound identical with the tread of the tire. Put up in collapsible tubes. No. 7805 Reg. Price, \$0.50; Cut Price, \$0.30

If by Mail Add 5 Cents Postage.

Rubber Tread



RUBBER TREAD is a high grade rubber compound in a plastic form for filling in cuts and dig-outs in Casings. It is easily applied with the fingers in a manner similar to putty and dries into a compound identical to the tire. It will save your tires, preventing sand pockets and blisters.

Prompt applications of RUBBER TREAD will prevent sand pockets and blisters which are so destructive to tires. Sand blisters are the forerunners of blowouts and a prevention of these mean less tire bills and considerably less trouble. RUBBER TREAD helps keep down the tire upkeep.

No.	Reg. Price	Cut Price
3311 Small can, each	\$0.50	\$0.30
3312 Large can each	1.00	.55

By Mail Add 5 Cents Postage.

National Auto Supply Co., Dept. B, 77 Chambers Street, New York City.

Please send me the following articles as advertised for which I enclose \$.....

Name and Address.....

Fill Out—Cut Out—Mail To-day

Name and Address.....

National Auto Supply Co., Dept. B, 77 Chambers Street, New York City. Please send me by return mail your "Free National Auto Supply" Catalogue.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

THE VASCO

Model 1-30 x 41	Full Channel Brass,
Model 3-40 x 41	Semi-Clear Vision,
Model 5-30 x 41	Full Clear Vision,
Model 2-30 x 43	Full Channel Brass,
Model 4-30 x 43	Semi-Clear Vision,
Model 6-30 x 43	Full Clear Vision,
Model 1912-41 inch	Fold in Middle,
Model 23	Zig-Zag Shield, Vasco Bumper,

VASCO WIND SHIELDS CAN NOW BE PURCHASED AT A SAVING OF 40% OVER FORMER PREVAILING PRICES

This sweeping reduction is made possible through the new selling campaign we have inaugurated and our determination to **ship Vasco Wind Shields direct to the consumer if your local agent cannot supply you, or do business only with our direct representatives whom we are now establishing in every city in the United States.**

Never before in the history of Wind Shields could a strictly high-grade product be purchased for so little money.

Our new prices are not the result of cheaper manufacturing facilities, neither have we installed cheaper material to make this new price possible. Our margin of profit is the same as in the past and the consumer gets the entire benefit. We are simply doing business direct with the automobile owner or through a local dealer instead of selling our entire output to the wholesale trade as in the past.

In the VASCO Wind Shield is embodied every essential feature necessary for a perfect shield, and in addition the VASCO contains many exclusive features which can be found in no other Wind Shield.

Automatic One Hand Control—Six Different Positions—Simplicity of Design—Elegance of Finish—Always Dependable—Positive Locking Automatic Friction Disk—Can be Locked at Any Angle—Folds over Hood When Desired—Clear Line of Vision—No Spring Catches or Intricate Mechanism—Cannot Break, Rattle or Work Loose.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

WIND SHIELD

formerly \$40.00.....	NEW PRICE, \$25.00
formerly \$42.50.....	NEW PRICE, \$25.00
formerly \$45.00.....	NEW PRICE, \$25.00
formerly \$42.50.....	NEW PRICE, \$27.50
formerly \$45.00.....	NEW PRICE, \$27.50
formerly \$47.50.....	NEW PRICE, \$27.50
formerly \$25.00.....	NEW PRICE, \$15.00
formerly \$30.00.....	NEW PRICE, \$17.50
formerly \$15.00.....	NEW PRICE, \$12.00

DEALERS AND AGENTS

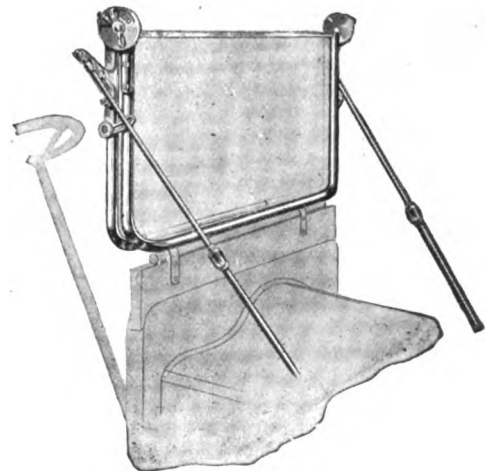
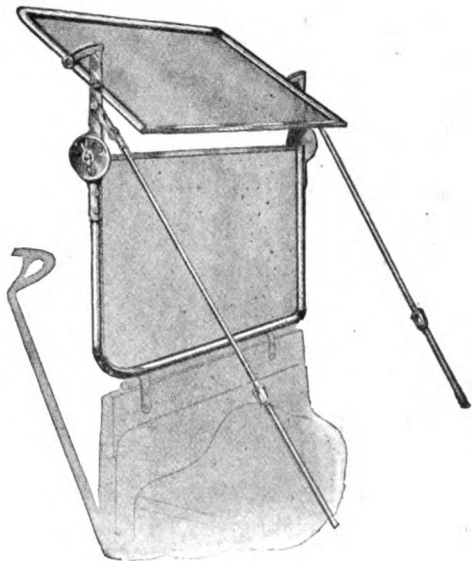
If, you are interested in a money-making proposition that assures quick sales, fair profits, and will immediately put you in touch with most of the car owners in your immediate territory, you had better write us to-day for our special proposition to dealers, for if your territory is still unallotted and you are in a position to give us a fair, honorable representation, we are prepared to open negotiations immediately.

The VASCO Wind Shield is not a new product. In fact, it has been successfully sold in competition with the highest price Wind Shields on the market during the past three years. Our reputation is thoroughly established and at the new prices now in force the VASCO is sure to be in greater demand than any other make of Shield you can possibly carry.

Our extensive advertising campaign, covering all the leading publications, will be the most instructive and comprehensive ever undertaken by a Wind Shield manufacturer. Hundreds of inquiries are reaching us daily as the result of our advertising, and every inquiry is being referred to our local dealers, who in turn experience no trouble in securing the business.

In addition to our advertising campaign we have a co-operative selling plan which will not only aid you in securing the local trade on Wind Shields, but will put you directly in touch with the automobile owners in your section and he is the one in whom *You* are interested.

Write to-day for our Special Dealers' proposition. We desire to arrange all our selling agencies and distributing points before May first. If you have handled Wind Shields in the past, tell us so and how you are equipped to represent us in your territory.



Victor Auto Supply Mfg. Co., Inc.

35 West 43d Street, - - New York City

Please mention the Automobile Dealer and Repairer when writing to advertisers.

A. S. B.

TIRE PROTECTOR

An Offer to Car Owners

If we have no agent in your city or town handling the A. S. B. TIRE PROTECTOR as a separate line, we will send you one

ABSOLUTELY FREE

*This offer is good only for
30 days from date of this issue.*

This offer is made in order to prove to you that the A. S. B. Tire Protector is the only mechanically **Perfect Tread** on the market; that it will give you longer service than the tire itself, and absolute freedom from puncture and blow-out—or other tire trouble.

The A. S. B. Tire Protector is the only tread that **always** runs evenly on the face of the tire.

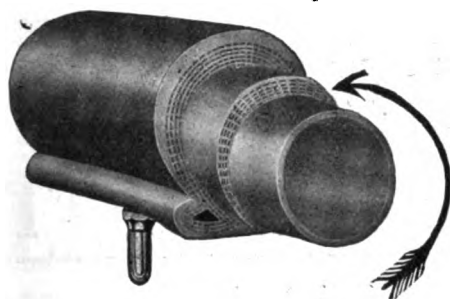
The A. S. B. Tire Protector is guaranteed not to heat the casing or tube as the openings on the side give the air a chance to circulate and cool the tire. In fact a tire equipped with an A. S. B. Protector runs cooler than without one.

With your car equipped on all four wheels with the A. S. B. Tire Protector you can figure on from four to eight thousand miles without tire expense or trouble.

If you want our offer of one tread free, write at once for particulars.

Queen Manufacturing Co.

41 Seneca Street, WEBSTER CITY, Iowa

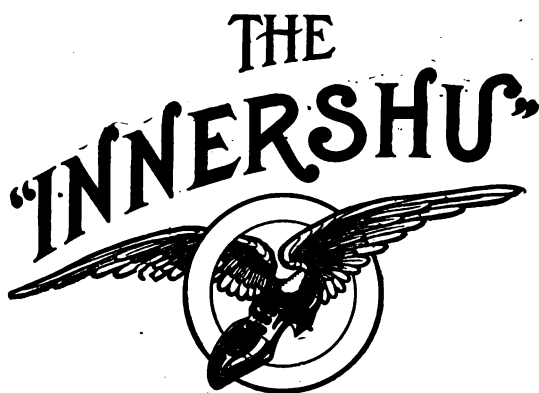


Made of Bullet-Proof

Sea Island Cotton Fabric, formed and stretched by our special secret process to exactly fit a tire so as to relieve it from all strain from within. Protects the tube. **DOUBLES** tire mileage. Is blow-out and puncture proof.

Easily placed and out of sight. Insures 75 per cent. decrease in tire troubles and expense.

**INSIST ON THIS
LABEL**



LABEL COPYRIGHT 1908
BY INNER SHOE TIRE CO.

PROTECTS Against Imitations

INSURES the Original and Only

“INNSHU”

GIVES An Absolute GUARANTEE

To Produce Satisfactory Results

ASK YOUR DEALER

===== **OR WRITE** =====

INNER SHOE TIRE COMPANY

Grand Rapids, Mich.

U. S. A.

WANTED

Jobbers, Dealers and Tire Repair People to write us at once for
our Special Proposition on

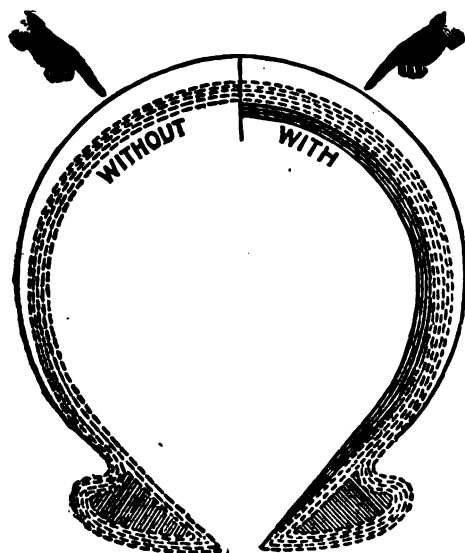
Smethport Full Value Inner Tubes and Smethport Reliners

LOOK FOR THIS
TRADE MARK



WHEN SELECTING
INNER TUBES

IT IS A GUARANTEE FOR SATISFACTION



SMETHPORT RELINERS

will give you 1000 to 3000 more Miles from your
Old Casings.

You Do Yourself an in-
justice if you do not inquire
at once.

We also manufacture
BLOWOUT PATCHES,
INNER TUBE PATCHES
and all kinds of
MOLDED RUBBER GOODS



SMETHPORT RUBBER CO.,

Smethport, Penna.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Sweeping Victory AND World's Records FOR THE **SPLITDORF MAGNETO**

AT THE JACKSONVILLE BEACH RACES

Fifteen out of twenty-two events won by SPLITDORF equipped cars:

- 20 miles open, 600 cubic inches, won by Merz (National), Time, 14.58.
- 100 miles, won by Disbrow (Pope Hartford), Time, 1.15.
- 5 miles open, won by Wilcox (National), Time, 3.13.
- One Hour race, heavy cars, won by Disbrow (Pope Hartford), 84 miles, world's record.
- One Hour race, light cars, won by Hughes (Mercer), 74.4 miles.
- 5 miles open, 231 to 300 inches, won by Hughes (Mercer), Time, 4.14.
- 10 miles open, 301 to 350 inches, won by Merz (National), Time, 8.36.
- 10 miles, free-for-all, Class D, won by Wilcox (National), Time, 7.00.
- 10 miles free-for-all, Class D, won by Hughes (Mercer), Time, 10.10.
- 10 miles, free-for-all handicap, Class D, won by Wilcox (National), Time, 10.09.
- 5 miles, 161 to 230 inches, Class C, won by Witt (E-M-F), Time, 4.20.
- 5 miles open, 301 to 450 inches, Class B, won by Wilcox (National), Time, 3.56.
- 10 miles open, 600 inches or less, Class F, won by Disbrow (Pope Hartford), Time, 7.42.

As a grand climax, Disbrow, in his Pope Hartford, won the 300 mile race, lowering the world's record for 50, 150 and 200 miles. Time, 3.53.33.

All SPLITDORF Equipped.

Following the recent decisive SPLITDORF triumphs at Los Angeles and New Orleans, this is surely a SPLITDORF year.

These brilliant victories again prove the unfailing ability of the SPLITDORF Magneto to furnish ignition that wins races and also gives Absolute Satisfaction to the tourist.

PLEASE WRITE FOR MAGNETO CATALOG.

Chicago: 319 Michigan Ave.
San Francisco: 520 Van Ness Ave.
Detroit: 868 Woodward Ave.
Boston: Motor Mart.
Los Angeles: 1226 S. Olive St.

C. F. SPLITDORF
Walton Ave. and 138th St.
Branch 1679 Broadway,
NEW YORK



Stop That Smell!!!

Turn Skunk Power Into Horse Power

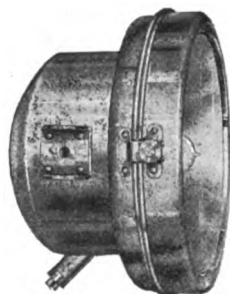


with a hot spark that shoots the mixture while it is in the cylinder.

The hot K-W Magneto spark shoots the mixture instantly and thoroughly and none of it is lost in the exhaust to create a smell.

ELECTRIC ROAD LIGHTING OUTFIT

"The
Successor
to
The Gas
Tank"



Current
Direct
from
Magneto

THE K-W ROAD LIGHTING OUTFIT—
Magneto, pair of Head Lamps, Switch, Wire and
Bulbs, all complete for \$50.00.

THE SIMPLEST ELECTRIC LIGHT OUTFIT IN THE WORLD

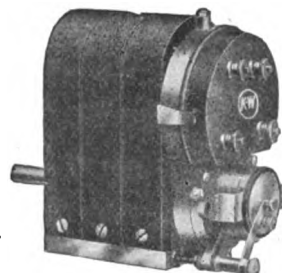
NO Storage Battery to Sulphate or Short Circuit.
NO Commutator or Brushes to make Trouble.
NO Complicated Cut Out to go wrong.
NO Delicate Ammeter or Voltmeter to lie to you.
NO Complicated Electrical Connections.

And the PRICE is right.

K-W belt or friction drive Magnetos run the
lights at night and can be switched off in the day-
time or used for ignition with coil and timer. High
Tension Magnetos do not run electric lights.

THE K-W HIGH TENSION MAGNETO

Model J
Guaranteed
to Start
Any Auto
Engine
up to 30 H.P.

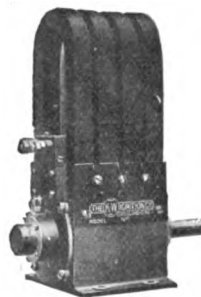


No Coil
No Timer
No Batteries
4 Cyl. \$50 00
6 Cyl. 55.00

Extremely simple—nearly half less parts than any other
Magneto. Perfectly reliable.

We make larger Magnetos for larger engines.

If you cannot gear drive a High Tension Magneto use one
of our \$35 00 Low Tension belt or friction drive Magnetos,
and a K-W Spark Coil.



Low Tension.....\$35.00
Belt or Friction Drive.
Used with K-W Coils.
NO Moving Wires.
NO Brushes. No Commutator.
Runs in ball bearings.
Starts engine without batteries.



The K-W Spark Coil.
4-Cylinder.....\$30.00
2-Cylinder..... 18.00
Has its winding
GUARANTEED FOREVER
against breakdown.

WE PAY THE EXPRESS East of the Mississippi River or to
the Mississippi on points beyond, on any of our goods, when
cash accompanies the order.

No matter what your Ignition troubles are we have a guaranteed cure. We also make Low Tension
Magnetos and Spark Coils.

WRITE FOR CATALOGUE 16—JUST OFF THE PRESS



FOR SALE BY

New York: A. H. Green & Co., 1686 Broadway.
Boston: Mr. W. J. Forbes, 70 Long Wharf.
Philadelphia: Vail-Schaefer Co., 608 Arch Street.
San Francisco: Weinstock-Nichols Co., 575 Golden Gate Avenue.
Los Angeles: Weinstock-Nichols Co., 1216 S. Olive Street.
Buffalo: J. W. Frey, 700 Main Street.

Canada: Canadian General Electric Co., Toronto and Branches.

Syracuse: Syracuse Rubber Co.
Portland, Oregon: Rober Machinery Co., 281 East Morrison Street.
Kansas City: Kansas City Auto Supply Co.
Omaha: Powell Supply Co.
New Orleans: Interstate Electric Co., Baronne and Perdido Streets.
Cincinnati: L. E. Bedinger, 217 East Third Street.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Every Automobile Dealer Will Find it Worth His While To Read This

This should be called an "I told you so" advertisement. We are publishing it at this time so that within six months we can advertise that we made the prediction contained herein.

That is our sole purpose. We are not seeking more dealers. Our entire output for 1911 was taken months ago. We cannot accommodate all the dealers we have, but we do want you and all others who have money invested in this business, and who at times have felt the shifting of conditions, to realize that there is a solid foundation upon which the industry is founded and upon which it is well for them to build.

In 1908, 552 clothing manufacturers failed, with liabilities of \$5,376,196. You probably cannot recall a single one of these 552 firms that failed. The industry went on.

In 1909, 446 manufacturers failed.

Clothing is considered the country's greatest staple. The fact that so many makers were unable to weather competition does not prove that less clothing is being bought. It merely shows that conditions have changed. The progressive firms have taken the lead. It proves that they have succeeded at the cost of less fortunate, less competent manufacturers.

Such a change is now taking place in the automobile industry. In its most prosperous times, when the demand was greater than the supply, there were failures.

Five years ago practically every state had an automobile manufacturer. There are fewer makers today. There will be even fewer next year, and so also the next year. It is a process of concentration—of elimination.

The "survival of the fittest" is trite and has been used again and again, but it clearly suits the conditions that now prevail.

The "I told you so" part of this advertisement is this: We want you to watch the HUDSON this Spring. Your success depends upon your obtaining that car which is the best seller.

In your town the leading clothing store sells either Hart, Schaffner & Marx, Kuppenheimer, Stein-Bloch or one or two other similarly well-known lines. It sells Dunlap, Knox or Stetson hats. The leading dry goods store has the exclusive agency for a specialty that is as well known.

That is the thing that will make the automobile dealer strong. Watch the trend of the times. It will be easy to see in the next two months which lines will be the greatest, easiest sellers. That is the line for you to tie to.

The basic policy of this Company is to bring into the organization men who are efficient, aggressive "live wires." That policy prevails in the factory—among the testers, the gate man—in the engineering and sales forces. It applies just as forcibly to the dealer. If you think you are a live wire, write us. We may want to consider you.

HUDSON MOTOR CAR COMPANY

6034 JEFFERSON AVE., DETROIT, MICH.

(No. 52)

SPECIAL NOTICE

CONCERNING

K & W PATENT RELINERS

To Consumers, Dealers, Jobbers and Tire Repair People.



Reg. Applied For.
Above shows K & W Reliners strengthen tires so much that they may be worn entirely through without having blow-outs.

The K & W Patent Reliner

was "the first successful reliner" ever manufactured, and is, and always has been, made of a better quality of material than any imitation or infringement.

Remember, The K & W Patent Reliner [is Fully Guaranteed.

TIRE REPAIR PEOPLE everywhere are using K & W Patent Reliners in their repair work, which proves they are a good thing to strengthen weak tires.

We guarantee K & W Patent Reliners to eliminate your tire trouble and tire expense and agree to refund money if reliners are not satisfactory in every way.

You might be surprised to know that there are nearly 15,000 K & W Patent Reliners in successful use at the present time.

Eventually, K & W Patent Reliners will be used by all auto owners as a means of preventing tire trouble and reducing tire expense.

**Be sure you get a K & W
IT'S BEST.**

For sale by nearly all dealers, jobbers and tire repair companies. If your dealer does not have them, write us AT ONCE for our Proposition on a Trial Order.

K & W MFG. CO., 3rd St., Ashland, Ohio.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

As manufacturers of K & W Patent Reliners, which are sometimes called Inner-Shoes, Inside Tire Protectors, Inner-Tires or Tire Reinforcements, we are pleased to advise you that we own, EXCLUSIVELY, patents which are basic and which cover the reliner thoroughly. What the SELDEN PATENT is to the gasoline automobile—our patents are to the successful inside tire protectors.

No doubt you are aware that there are several imitations and infringements on the market, the manufacturers of which claim to have "something just as good." Our reliners are semi-cured; a feature which is covered by patents. Under-cured reliners tend to become cured by the heat generated by the friction of the tire on the road, while full cured reliners would become over-cured and deteriorate rapidly. This is why semi-cured reliners remain soft and pliable and are of long life.

The K & W Patent Reliner is coated with a vulcanizing compound which causes it to adhere firmly to inner walls of tire. Thus, it will not creep or generate heat by its use. This feature is also patented. Patents "also" cover coating inside of tire with a vulcanizing compound before applying Reliner.

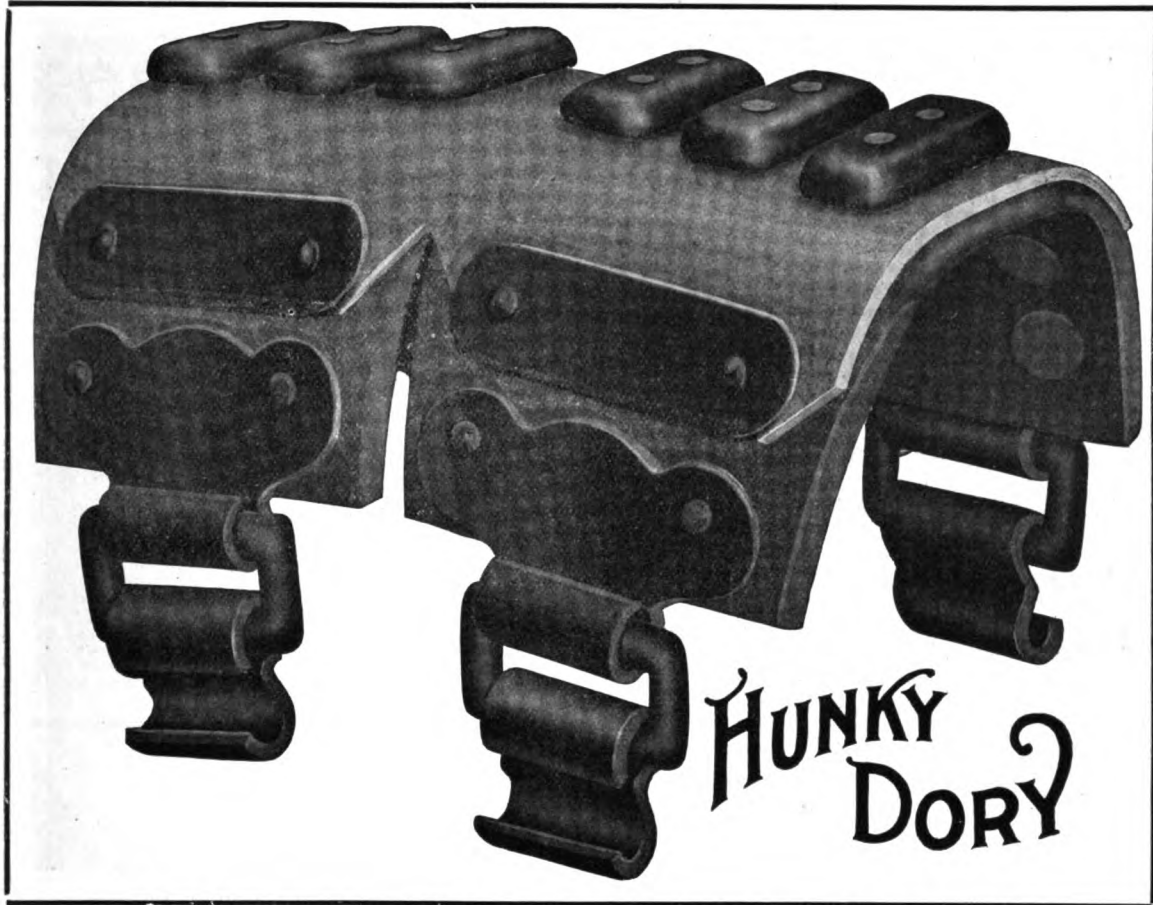
Therefore, when anyone offers you a semi-cured or cement coated reliner by whatever name called, they are imitators or infringers unless the following dates of patents are stamped on inside of reliner:—"Dec. 28th, 1909, and Jan. 4th, 1910." Evidence is being secured against infringers and prosecutions will follow.

Why should you purchase these imitations and infringements when you can purchase the original "patented" reliner at no greater cost?



Reg. Applied For.
These Tires can be seen at our Office.

WALKER AUTO TIRE BANDS



A Hunky-Dory Blow-Out Patch

is a mechanically constructed, absolutely perfected means of effectively repairing a weakened or blown-out automobile tire. It won't stretch, creep or get out of shape. It can be put on in a few seconds.

Saves the Expense of Vulcanizing

is much cheaper, and when it's on you have the positive knowledge that it's going to hold. The HUNKY-DORY patch is a double section cut from our regular 1911 latest improved sectional protector and not only answers the purpose of the best possible means of repairing a ruptured casing but is a positive convincer of the wonderful service to be obtained from our complete sectional protector.

The Price of a Hunky-Dory is \$1.75 Postage Paid

to any point in the UNITED STATES, and it's simply a forerunner to the certain purchase of a complete equipment of our sectional protectors, for when you have tried this wonderful HUNKY-DORY patch you readily realize a full set of our protectors made just like a HUNKY-DORY patch, that covers the tire completely, is just the article you are mostly in need of.

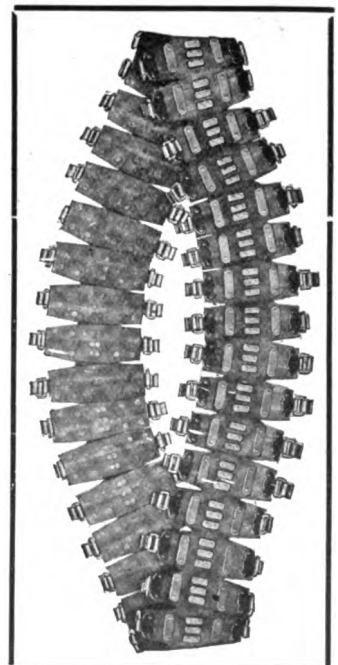
Tire Expense and Annoyance Ends

with a complete equipment of WALKER 1911 SECTIONAL PROTECTORS.

Just Send Us \$1.75

in stamps, check, draft or money order and we will send the HUNKY-DORY patch POSTAGE PAID. If it doesn't suit you, fire it back and we will return your money by next mail; if it does suit, which we are certain it will, use it until you're satisfied that it's the best article made for the purpose, aside from our regular complete protector, and with your order for four full coverings we will allow you the price paid for the Hunky-Dory patch.

We don't mean to knock the other fellows' goods (they'll get knocked soon enough in service), but we simply tell you we've got the best tire protector made and a HUNKY-DORY patch will convince you that we're right.



Write today for catalogue and order HUNKY-DORY patch at once.

***SOME GOOD AGENCY PROPOSITIONS OPEN.**

WALKER AUTO TIRE BAND CO., Indianapolis, Ind.

Please mention the Automobile Dealer and Repairer when writing to advertiser.

Mr. Dealer

Will You "Hold the Sack" Again?

There have been many imitations of the Prest-O-Lite Gas Tank.

But most of the imitations went out of business, leaving their dealer friends to "hold the sack," with a lot of tanks that could neither be sold nor re-filled.

And there will be other imitators—

Likewise, other dealers that will "take a chance." But

You Take No Chances on

Prest-O-Lite

It's the tank your customer wants.

It's the tank that, when empty, can be promptly exchanged for a full one, **anywhere and always.**

Prest-O-Lite has been a big **money-maker** for dealers.

Imitations have invariably been **money-losers** for dealers.

IT'S UP TO YOU

The Prest-O-Lite Co., 251 East South Street,
Indianapolis, Ind.

BRANCHES at New York, Astoria, Boston, E. Cambridge, Providence, Philadelphia, Pittsburg, Cleveland, Cincinnati, Detroit, Chicago, Milwaukee, Minneapolis, Kansas City, Omaha, Dallas, Los Angeles, San Francisco, Emeryville, Baltimore and Seattle.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Punctures and Blowouts Re- paired Without Vulcanizing

For **one-tenth** the cost of vulcanizing you can repair any puncture or blowout in tube or casing easier, quicker and **better**, with just your two hands and



To repair any kind of a hole in either tube or casing, first clean the rubber around the hole with gasolene or emery cloth.



Then apply Tire-Doh Cement around the edge of the hole and on the surrounding surface of the tire, allowing it to dry 5 to 10 minutes.



Then knead enough Tire-Doh into and around the hole so it forms a neat patch. Press down firmly around the edges. That's all. Vulcanizing couldn't do a better job.

Special Offer to Auto Supply Dealers

Write us on your business letterhead, enclosing your check for \$1.50, and we will send you the regular \$2.00 outfit for you to test and use. Money back upon request.



The pictures tell the story

With TIRE-DOH you can **permanently** repair **every injury** that can happen to a **tube or casing absolutely without vulcanizing**. It takes only a few minutes, in the shop or on the road. TIRE-DOH "sets" almost instantly and is then **as tough and elastic as the tire itself**, capable of withstanding just as much pressure and just as hard use.

In our own shop we repaired thousands of tires with TIRE-DOH before we put it on the market. It **never** failed. In 1910 we sold fifteen thousand Tire-Doh Outfits to motor car owners **offering to refund money upon request**, and we are still in business.

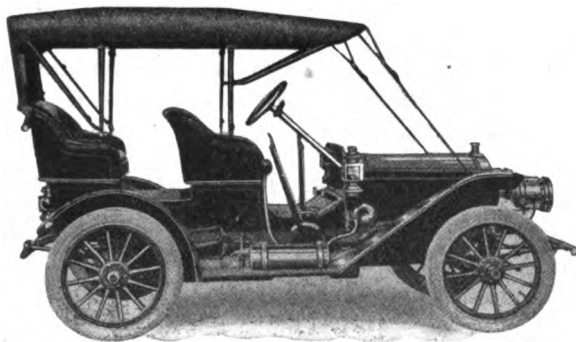
Will you try TIRE-DOH **at our risk?** Then **ask your dealer** for a Tire-Doh Outfit **to-day**. If he hasn't any tell him to get one for you; or **you send coupon below** with \$2.00 and we will send you one, express prepaid, **immediately**. You run no risk. Money back if you ask it.

**Tear Off
Coupon
NOW**
**as a
Reminder**

ATLAS AUTO SUPPLY CO., 30 East Adams Street, Chicago, Ill.
Enclose this \$2.00 and me a TIRE-DOH OUTFIT, express prepaid, please.
In condition that you will return my money in full upon request.

Name _____
Address _____
My Dealer's Name _____
Address _____

Please mention the Automobile Dealer and Repairer when writing to advertise.



4 Bow Auto Style

AUTO TOPS

Mohair—Genuine material our specialty.

Our large production enables us to give greater values than any other top manufacturer.

Fit guaranteed on any make of car. We ship sudden.

Send for our catalog and money saving prices. We can save you money no matter if you buy one or a hundred tops.

We sell Wind Shields—at a great saving to you.

WISCONSIN AUTO TOP CO.
Racine, Wis.

40% PROFIT ON EVERY DOLLAR YOU INVEST

This Can Be Realized in Operating a

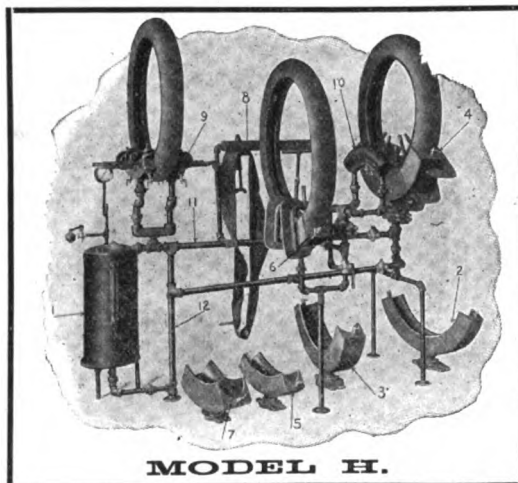
MARBLE-HAYWOOD

Do Your Other Departments Pay As Well?

The time has come
when inferior
methods and machinery
MUST be abandoned.

The **PROFIT** is now
going to those equipped
to do satisfactory work
at a minimum price.

**ARE YOU GETTING
THIS PROFIT?**



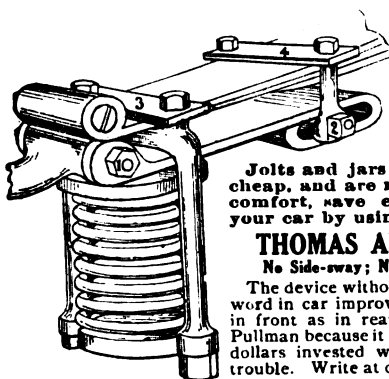
MODEL H.

Model H is the garage
man's plant and enables
him to do **ALL** tire re-
pair work—**RETREAD-
ING—SECTIONAL—
TUBES**—without the
expense of a large boiler
and the loss of floor space.

Send for catalog
and proof of the
40% profit.

HAYWOOD TIRE & EQUIPMENT CO.,

528 N. Capitol Avenue,
Indianapolis, Indiana.



AUTOISTS! ATTENTION!

Jolts and jars make the best car seem cheap, and are no longer necessary. Have comfort, save expense, give new life to your car by using

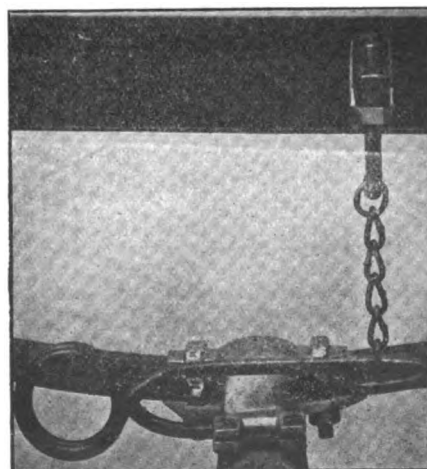
THOMAS AUXILIARY SPRINGS

No Side-sway; No Upthrow; Absorb all Shocks

The device without a rival, because it is the last word in car improvement and works just as well in front as in rear. Makes your car ride like a Pullman because it is the acme of flexibility. A few dollars invested will save you many dollars in trouble. Write at once for trial offer to

THOMAS AUXILIARY SPRING WORKS

CANISTEO, N. Y.



IDEAL

Shock Absorber

does the business to perfection, no parts to wear or need adjustment, perfectly noiseless, attaches readily to cars in general. Price is right.

AGENTS AND JOBBERS WANTED

These can be carried in stock. Write for full description and trial offer.

C. L. THOMAS
CANISTEO, N. Y.

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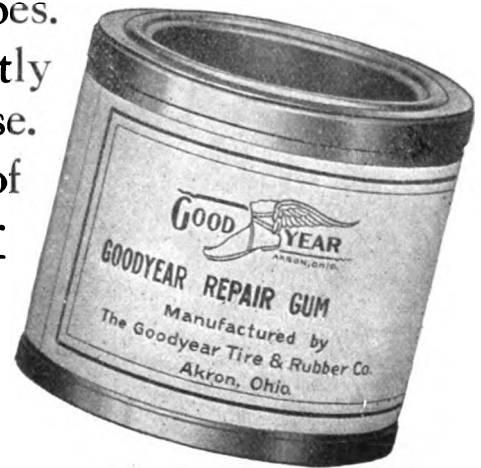
A Simple, Easy, Quick Way to Repair Punctures and Cuts

**By Far the Easiest Way to Quickly Repair Cuts in a Tire's Tread
is by the Goodyear Method, Described Below.**

Goodyear Quick Repair Gum simplifies the repair of cuts in the tread as well as punctures in inner tubes.

By this method the cut is permanently fixed. In a short time the tire is again in use.

Simply apply cement to the interior of the cut. Then fill the cut with Goodyear Quick Repair Gum. After standing a short time the tire is again ready for service. The preparation is a cross between cement and raw gum.



In repairing an inner tube, draw the cement-covered edges together. Then apply another cement coat, and apply the Goodyear Quick Repair Gum to the cut, allowing a quantity to remain on the surface of the tube. In a short time the tire is permanently repaired and ready for service.

Automobile owners find Goodyear Quick Repair Gum a wonderfully convenient method of repairing cuts and slashes.

Other **GOOD** **YEAR** Accessories

Inside Tire Protectors, Rim Cut Patches, Self-Cure Repair Outfits, Lever Handle Grips, Inner Tube Bags, Protection Patches, Sifter Top Talc Tubes and other accessories.

Dealers, Repair Men, Garage Men find that Goodyear accessories are producers of bigger business than any other line. This is due to the absolute satisfaction given by every article and by our tremendous advertising campaigns which have made these accessories known to every driver of an automobile. Write today to

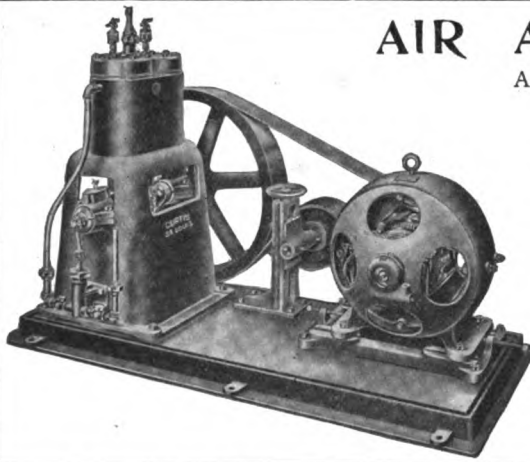
The Goodyear Tire & Rubber Company

Sprague Street, AKRON, OHIO

Branches and Agencies in All the Principal Cities

(162)

Please mention the Automobile Dealer and Repairer when writing to advertisers.



AIR ALWAYS ON TAP

AT THE RIGHT PRESSURE AND NO WAITING.

The CURTIS GARAGE AIR UNIT.

A common sense Air Pump—made in several sizes—will stand intermittent or 24 hour service—will last a lifetime without frequent repairs. Built to the same design as our famous standard CURTIS AIR COMPRESSOR, found in most all industrial plants. The same high volumetric efficiency that means **cheap air**. The same **automatic governing** that assures **uniform pressure** whether pumping into the air tank or direct into the tire.

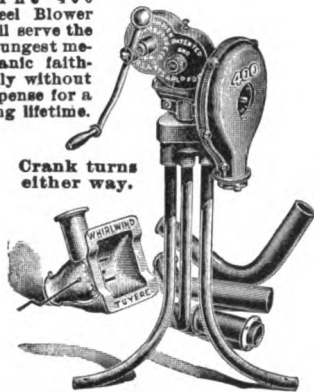
A PERMANENT PAYING INVESTMENT.

Write for Particulars.

CURTIS & CO., 1530 Kienlen, St. Louis, Mo.

The Incomparable 400 Blower, the one great Heirloom that will be handed down from one Generation to the other. Ask What the Owners Say.

The 400 Steel Blower will serve the youngest mechanic faithfully without expense for a long lifetime.



Crank turns either way.

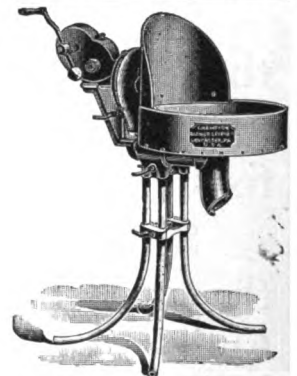
The Famous 400 Champion Steel Blower.

Over one half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.

The No. 400 Champion "Whirlwind" Blast Anti-Clinker, Heavy Nest Tuyere Iron is furnished with all 400 Blowers WITHOUT EXTRA COST.



No. 400 Steel Blacksmith's Forge.



No. 401 Steel Rivet Forge.

Champion "Patented" Automatic Self-Feed and Lever-Feed Upright Post Drills

Made With Ball Bearings only

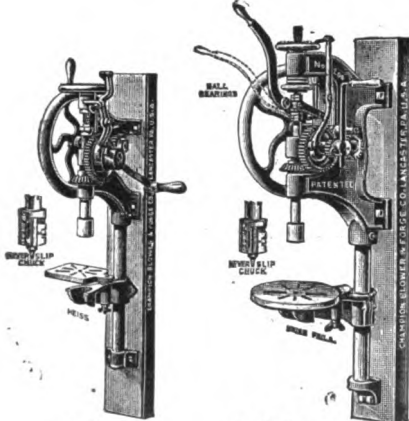
With the LEVER- or AUTOMATIC SELF-FEED

95 per cent in Time and Labor is Saved

by the INSTANTANEOUS RAISING of the Drill Bit out of the hole just bored and again replacing the drill bit back on the material ready to bore the next hole.

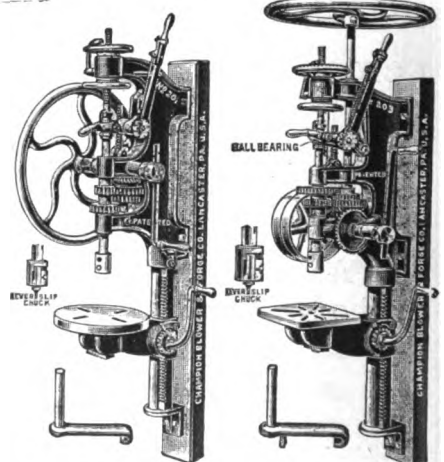
Remember—There is no TURNING BACK of the FEED Screw NUT WITH EITHER FEED.

Before purchasing a Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power Blower, or Electric Blower, write for our free catalogue, which always shows the greatest variety of improved Blacksmith tools built under one control in the world.



No. 90 Drill.

No. 200 Lever-Feed Drill.



No. 201 Self-Feed and Double Compound Lever-Feed Drill.

No. 200 Self-Feed and Double Compound Lever-Feed Drill.

THE CHAMPION BLOWER & FORGE CO., Lancaster, Pa., U. S. A.

Bair Auto Top Holders

Will be found on every car *now* manufactured by "The Oldsmobile," "Chalmers," "Rainier," "Pope," "Hartford," "Austin," and others.

Pretty Good Evidence, Isn't It?

Don't wait until your car-top gets shabby. Buy a set of Bair Holders from your top manufacturer, jobber, or dealer. Do it now.

WRITE FOR OUR CATALOG.

Gotshall-Bailey Sales Co.,

SOLE DISTRIBUTERS,

1254 Michigan Avenue,

Chicago, Illinois.

Bair Holders "On the Job" Holding the Top as in a Vise, Preventing Rattle, Chafe and Side-Play. SOME CLASS.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Woodworth Treads

Make You Feel Safe

If you put a set of Woodworth Treads over your tires while the tires are still good and keep them well inflated, you can feel safe against tire troubles on any roads. You can also feel that you are equipped with a non-skid so that you are always ready for slippery places.

On account of the method of holding Woodworth Treads with coil springs they never become loose on the tire like protectors fastened to the rim or held with rigid rings, consequently there is no heating or chafing of the tire under them. The average user of Woodworth Treads pays no attention to his tires from the time the treads are put on until they are worn out except to keep the tires inflated.

Even on good roads, it is more economical to use Woodworth Treads than bare tires besides the advantage of doing away with punctures and skidding. Where the roads are hard on tires, the treads are especially valuable. We have just received the following letter from a user who has used them not only where the roads are hard on tires but in the livery service, which is the hardest possible service.

102 FAIRFORD ST., EAST, MOOSE JAW, SASK.

March 13th, 1911.

LEATHER TIRE GOODS COMPANY,
NIAGARA FALLS, N. Y.

Gentlemen:

Mr. McClellan of the Assiniboia Musce Co. has kindly handed us your letter of March 8th to him, so would ask you to send us your 1911 catalog and Trade Price List.

Woodworth Treads need no advertising in this country as they are well known and have a very good name. We had several pairs on our livery cars last season and they gave splendid satisfaction.

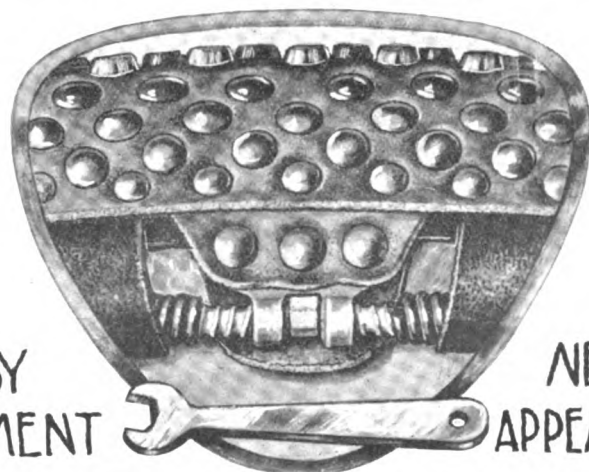
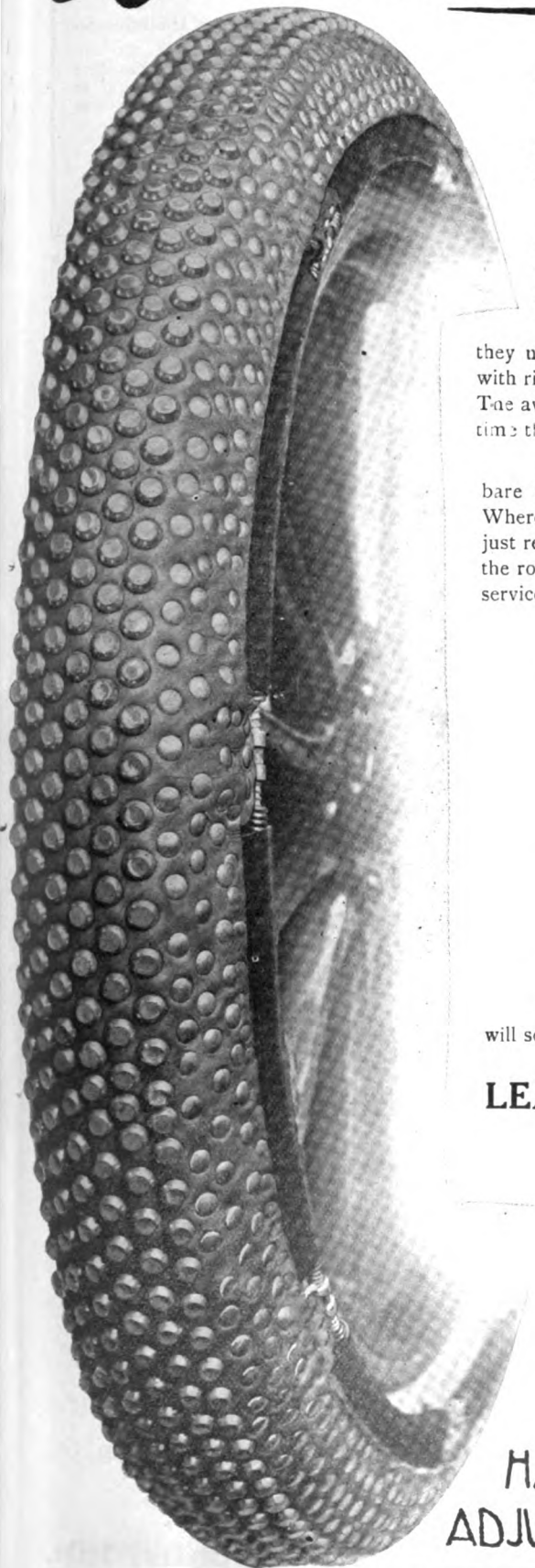
Yours truly,

(Signed) CRESCENT GARAGE CO.,
Box 757, Moose Jaw, Sask.

We have many letters like this from all parts of the country.

Send for our Catalog and Booklet on the Preservation of Tires, which we will send you together with copies of a few other letters from users.

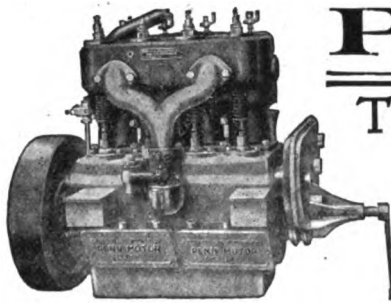
LEATHER TIRE GOODS CO., Niagara Falls, N. Y.



HANDY
ADJUSTMENT

NEAT
APPEARANCE

Please mention the Automobile Dealer and Repairer when writing to advertisers.



PENN MOTORS

THIS construction enables us to build the lightest, most compact and durable motor on the market.

Large Valve Areas and short lifts add to the power as well as the quiet running. Crank-shafts of the suspended type.

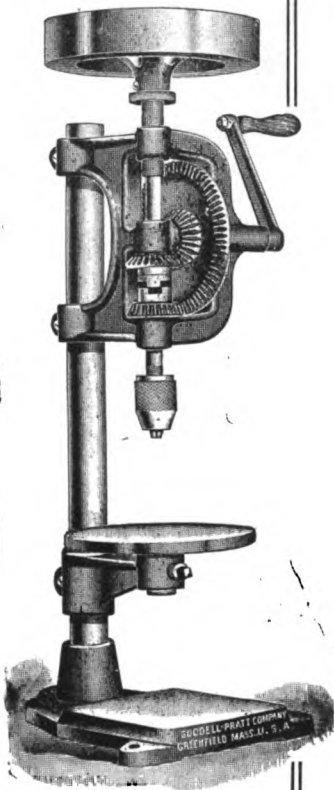
Motors are equipped with a self-contained oiling system, and all parts are interchangeable and accessible.

Large Water Jackets, circulation being complete around cylinders, and valve chambers of sufficient area to make possible to run either by forced circulation or Thermo Syphon.

TWO TYPES } 20-24 H. P., 4-cyl., 3½-in. bore, 4½-in. stroke.
 } 30-34 H. P., 4-cyl., 4½-in. bore, 4½-in. stroke.

Write at once for catalog giving full particulars.

Manufactured by **CHESTER ENGINEERING & MACHINE COMPANY, Chester, Pa.**



BENCH DRILL No. 72

This Machine will soon pay for itself in any repair shop not equipped with power.

It is thoroughly well made; the Tables are milled, the Gears turned and cut and it is furnished complete with a 3-jawed Chuck.

REMEMBER THE MAKE

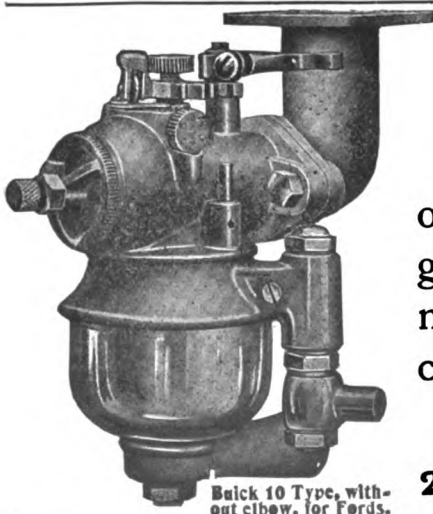
Goodell-Pratt's

Full particulars of this and other Bench Drills of our make are given in our Pocket Catalog No. 10-D, which we will be glad to send you.

GOODELL-PRATT COMPANY

Toolsmiths

GREENFIELD, MASS., U. S. A.



Special Heitger Carbureters for Small Cars

Made of Aluminum, nickel plated, heavy glass or metal float bowls, separate adjustments for gasoline, on high and low speeds, giving maximum speeds, fine control, minimum gasoline consumption. Special types for Motorcycles also.

HEITGER CARBURETER CO.,

240 West So. St.,

Indianapolis, Ind.

Buick 10 Type, without cilbow, for Fords.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

12TH
YEAR

The Supremacy of Diamond TIRES

12TH
YEAR

**IS NOT AND NEVER COULD BE FOUNDED
ON IMAGINARY BENEFITS**

Twelve years of Quality and Results have Written The Record. It is an open book to any investigator.

The users of

**DIAMOND CLINCHER TIRES
DIAMOND MECHANICAL TIRES
DIAMOND FISK TIRES
DIAMOND STRAIGHT SIDED TIRES**

have always received Tangible benefits,—Diamond quality and Diamond mileage.

You may select the type of tire, the kind of fastening and the rim.

There is nothing exclusive, no matter who makes the tire, about these details. We will furnish whatever you prefer.

The exclusive feature which we alone can furnish is

DIAMOND QUALITY

THAT COUNTS. It gives you the lowest per year and per mile tire cost.

Because we put Quality and Quantity of Rubber, Cotton, Workmanship, Experience and Skill into Diamond Tires to an extent unequaled by any other maker in the world.

Twelve years of such work have maintained (as they also explain,) Diamond Supremacy and it could be accomplished or accounted for in no other way.

When you buy Diamond tires you get more for your money—more rubber, better rubber, much thicker treads, tires that last longer, puncture rarely, stone-bruise less easily—things that COUNT!—Not mere talking points which cost the manufacturer nothing and cleverly distract your attention from the real issue.

New tires, new rims, new fastenings, new talking points, often cleverly presented, often to the uninformed most plausible,—come and go, but Diamond Quality and Diamond Supremacy, hand in hand, have remained constant and will continue so if we are right in fixing our attention on the essential principles—

**EXCELLENCE IN MATERIALS AND DESIGN,
ABUNDANCE OF MATERIAL—NO SKIMPING,
NO MISREPRESENTATION, DIRECT OR INDIRECT,
and THE SAME KIND OF APPLES
ALL THROUGH THE BARREL.**

It goes without saying that it costs us more to make Diamond tires as they are made than if they were thinner, lighter and weaker.

We have to ask more for them from the automobile manufacturer. That is why some builders refuse to furnish Diamond tires when you specify them.

You know that manufacturers of high priced cars without exception will furnish Diamond.

DOES THAT SUGGEST NOTHING TO YOU?

Some printed matter that gives valuable information about average tire upkeep expense, etc., on request. Ask for Booklet.

THE DIAMOND RUBBER CO., AKRON, OHIO

Stores and Service Stations in 54 Principal Cities, Covering Every Section.

IMPORTANT.—In a total of thirteen Automobile Shows from Maine to California (including The Garden and Palace Shows in New York and the National Show in Chicago) Diamond tires were the equipment on 589 Cars—nearest competitor 368

Empire Tires

WEAR LONGEST

EMPIRE TIRE CO., Trenton, N. J.

MAKE YOUR CAR UP TO DATE NOW

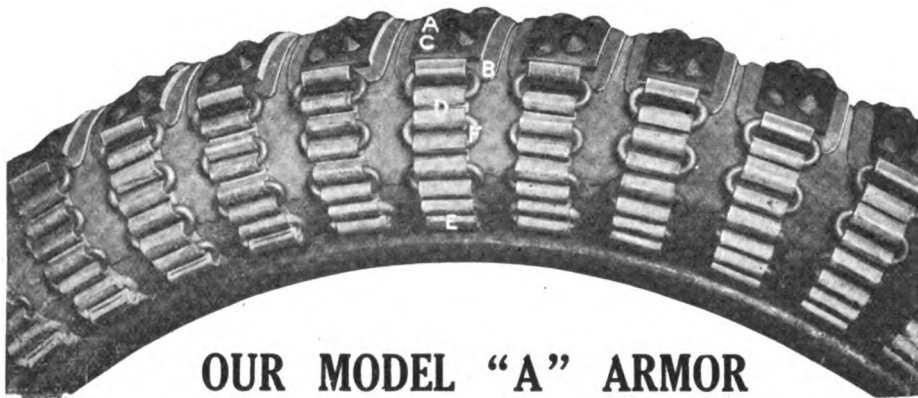
By Equipping
Your Tires with

DAVIS PNEUMATIC STEEL TIRE ARMOR

AND USING MID-WEST MOTOR SUPPLIES

STEEL

Puncture Proof
Blow-Out Proof
Rim-Cut Proof
Anti-Skid
Resilient as a
Rubber Casing.



NO LEATHER

to HEAT
to STIFFEN
to CRACK
or
to FALL OFF
Your TIRE.

OUR MODEL "A" ARMOR

IT IS AS NOISELESS AS ANY STEEL STUDDED TIRE. IN NO WAY AFFECTS THE INNERTUBE.

PRICE—ABOUT 60% OF CASING. WRITE FOR PRICES AND LITERATURE.

"Mr. USER"

It will be to YOUR advantage to write for our new 350 page catalog of "EVERYTHING FOR THE MOTORIST."

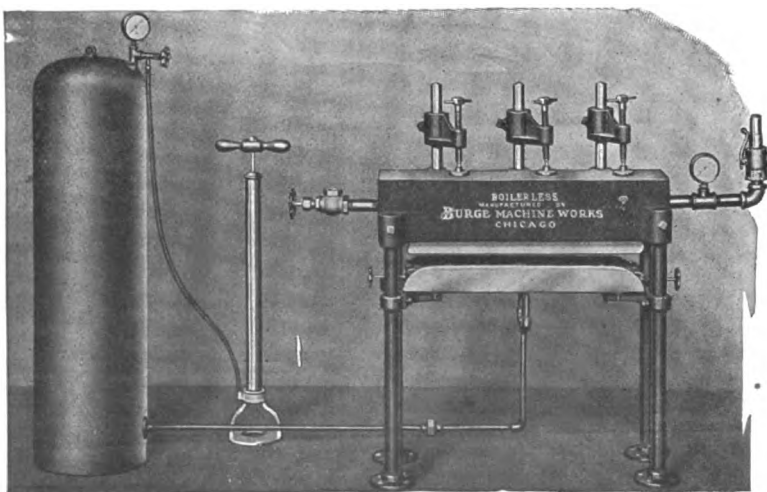
THE MID-WEST MOTOR SUPPLY COMPANY

Mid-West Building, 554 Jackson Blvd.
CHICAGO, ILL.,

U. S. A.

"OUR PRICES"

are 15 to 25% below the prices quoted the USER by any other Supply House. We sell only DIRECT to the CAR OWNER, at wholesale prices—absolutely no delay in shipment.



JUST WHAT YOU HAVE BEEN LOOKING FOR

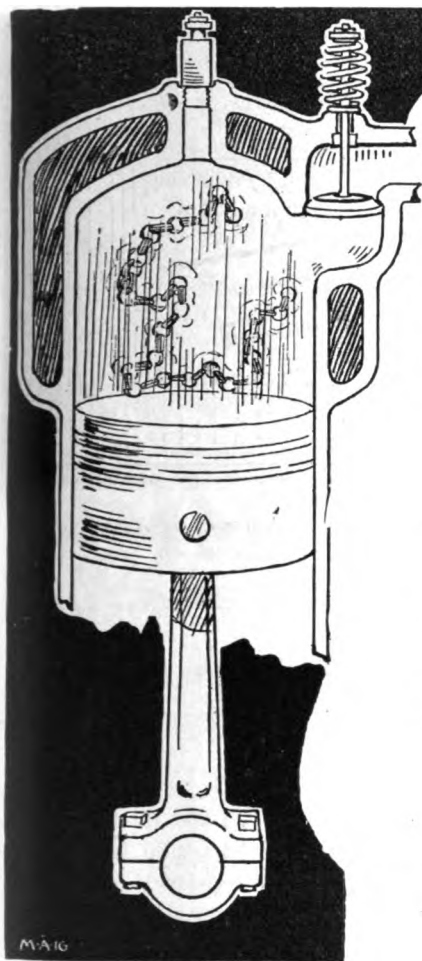
A STEAM Vulcanizer operated by Gasoline. The Excelsior makes its own steam, no boiler required.

Nothing but gasoline needed to produce the most perfect work on inner tubes. Equipped complete with gasoline tank, pump, steam gauge, pop valve, filling valve, drain cock, oil connections and our famous quick acting clamps ready for use.

If gas is more convenient than gasoline, we furnish the outfit arranged accordingly.

The Excelsior line of vulcanizing machinery is known from New York to California, and from Minnesota to Texas; anyone who has ever used an Excelsior Steel Retreading Kettle or Inner Tube Machine knows that they turn out the very finest work and in the shortest time, with the least amount of labor. Complete tire repair plants including boiler, kettle, air compressor, buffing stand, air receiver, motor, etc., etc. Write to-day for descriptive bulletins of the vulcanizing outfit that the tire manufacturers use themselves and recommend.

WISHART-BURGE MACHINE WORKS,
211-217 North Jefferson Street, Chicago, Ill.



MICHENER'S

Chain Carbon Remover

does more than any other kind—it actually cleans out all the carbon, from the pistons, top and sides of cylinders.

It is a flexible coil Chain made of unusually tough, soft wire, manufactured especially for this device, which is as flexible as a piece of twine and absolutely harmless to the motor.

Just poke it through a spark plug hole, inject a little kerosene. Screw back the spark plug and cut off the ignition on the cylinder being treated—then run the engine about two minutes. Simple as A B C

Here are a few testimonials. If you want more evidence send for our booklet of testimonials of owners of nearly all kinds of cars.

CHALMERS.

Rome, Ga.

I take great pleasure in saying that of all the Carbon removers I have tried, liquids included, this one is the easiest to use and most efficient of them all. It cleans perfectly the piston head, top and sides of cylinders and the head of intake valve. The "L" part of cylinders where the chain cannot reach is very accessible, and no trouble to scrape. Any owner of a car like mine should appreciate a device which will eliminate removing the intake valve cages and disturbing an air-tight joint difficult to secure again. With your "Chain" I can clean four cylinders perfectly in less time than any liquid carbon remover can partially clean one.

(Signed) DR. WILLIAM WINSTON, Dentist, West Building.

FORD

La Salle, Ill.

I have used your "Chain" Carbon Remover in a "FORD" runabout with excellent results. The carbon bakes hard in large quantities, and cannot be removed by kerosene or any of the so-called carbon removers which are in reality simply solvents for the oil blinder which holds the particles of carbon together. When this blinder itself bakes I have found no remedy except scraping, until I used your chain. Of course it is necessary to use the scraping method still for the valve chambers, but these fortunately are very accessible and easily cleaned.

(Signed) V. A. MATTHESON, Architect.

WINTON AND MARION

Lebanon, Pa.

Your "Chain" Carbon Remover I find to be simple, safe and sure. I used it on a "WINTON-RIX" also a "MARION" 4 cylinder motor, and it did all you claim for it. In my estimation its greatest value lies in the fact that it does the trick and cannot in any way do any harm whatever to a motor.

(Signed) CLARENCE S. WEIMER, Sec'y, Weimer Machine Works Co.

BUICK

Tampa, Fla.

I received your "Chain" Carbon Remover and used it according to directions, on my "BUICK." While the chain was doing its work in the cylinder I placed my hand in the smoke of the exhaust pipe when flakes of carbon would hit like hailstones.

The chain cost 75c, and to take down the engine, clean the cylinders by hand and replace them would probably have cost me \$7.50, and I doubt if the work would have been better, and perhaps not as good as the chain did.

Respectfully,
(Signed) C. W. CARLTON,
P. O. Box 650.
General Real Estate Business.

EMF

Stotts City Mo.

I received "Chain" Carbon Remover for E. M. F. and beg to say this is certainly one of the best de-carbonizers that I have ever used. I can heartily recommend them.

(Signed) EMERY HILL.

MOLINE

Peru, Ind.

Please send by return mail three of your "Chain" Carbon Removers. I used one of your chains in my MOLINE and it worked like a charm.

(Signed) WILLIAM A. HARE.

HUPMOBILE

Council Bluffs, Iowa.

Your "Chain" Carbon Remover works fine in the HUPMOBILE.

(Signed) J. H. CLEAVER, M.D.

STODDARD-DAYTON

Owego, N. Y.

Your Chain device for removing carbon works fine. Have a STODDARD-DAYTON and it's fine for this car.

(Signed) T. H. REDDIE,
Cashier Owego Nat'l. Bank.

REO.
Knoxville Tenn.
Referring to the "Chain" Carbon Remover, which I recently purchased from you, I beg to say that I have used same on my REO "30" four cylinder touring car, and find that it cleaned the cylinders thoroughly. Before using your "Chain" I found considerable difficulty in negotiating hills of any consequence at high speed, and was compelled usually to go into second and sometimes low in order to get up. After cleaning the cylinders, however, which took me about thirty minutes, I observed a marked difference in the power developed. I think you have a good thing, and I can heartily recommend it to all others.

Yours truly,
(Signed) CHAS. T. LEONARDT,
Sec'y and Treas., Knoxville Cotton Mills.

Sold in the Following Cities

AUGUSTA, GA., Peroux & Jones, Reynolds St.
ALBIA, IOWA, Reo Garage Co.
BALTIMORE, MD., Auto Supply Co.
BEATRICE, NEB., Wheaton Automobile Co.
BELLEVILLE, ILL., Modern Garage & Auto Co.
CHICAGO, ILL., Richard S. Morris Co., 40 Dearborn.
CEDAR RAPIDS, IOWA, I. M. Dodge.
CINCINNATI, O., Oseamp Auto Supply Co., Race St.
CINCINNATI, O., Bumiller-Remell Co.
CARMEL, N. Y., E. A. Ryder.
DELAWARE CITY, DEL., Wm. U. Raybold.
DENVER, COL., Denver Auto Goods Co.
DES MOINES, IOWA, Morrison Auto Co.
DAYTON, OHIO, The Geyer Sales Co.
DES MOINES, IOWA, L. J. Wells Livery Co.
EASTON, ILL., Penewitt & Fager.
ELGIN, ILL., D. M. Todd.
EAST PALM BEACH, FLA., Auto Garage Co.
FARGO, N. DAK., More Bros.
GAMBIER, OHIO, Gambler Garage Co.
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OMAHA, NEB., Western Auto Supply Co., Farnam St.
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PROVIDENCE, R. I., Belcher & Loomis Hdw. Co.
PHILADELPHIA, PA., Motor Specialties Co.

RICHMOND, VA., Dallas A. Shafer Co., North 8th St.
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TORONTO, CANADA, Electrical Specialties Co.
WACO, TEXAS, Reeves & Rotan.
WASHINGTON, D. C., Miller Bros., 1107 14th St.
WHEELING, W. VA., T. A. Westmeyer.
YOUNGSTOWN, OHIO, E. C. DeNormandie & Son.



If not sold by your dealer, let us send you one by return mail, postpaid, for 75c., or 3 for \$2.00 (you can clean two cylinders, with two chains at the same time).

This device does not work well in Horizontal motors, or the Cadillac or some of the "T" type motors like Maxwell, National, Austin, Thomas, etc.

E. S. MICHENER, 800 Washington St., New Castle, Pa.

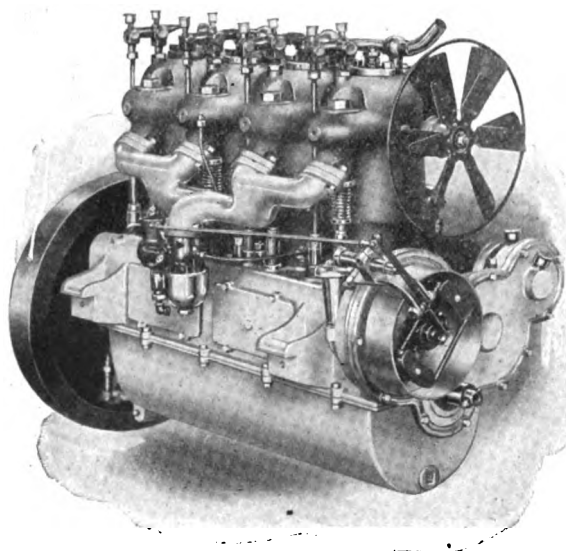
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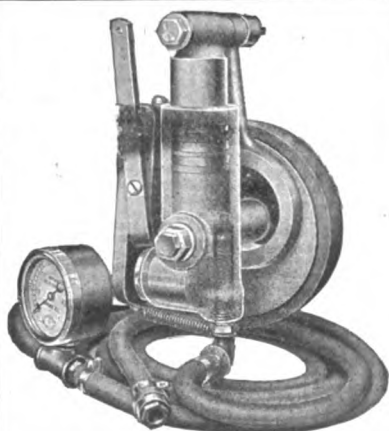
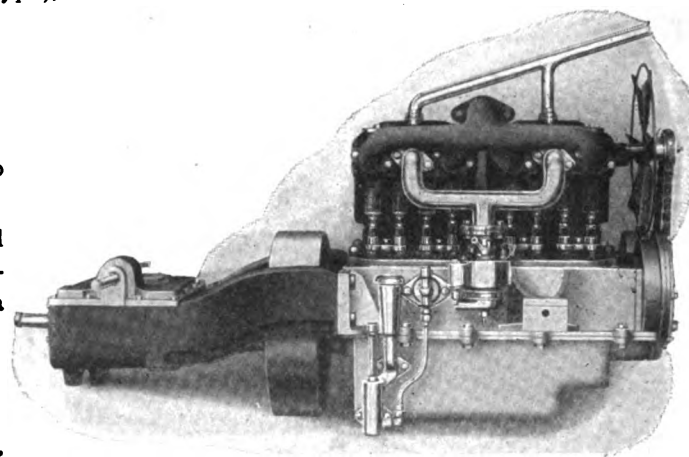
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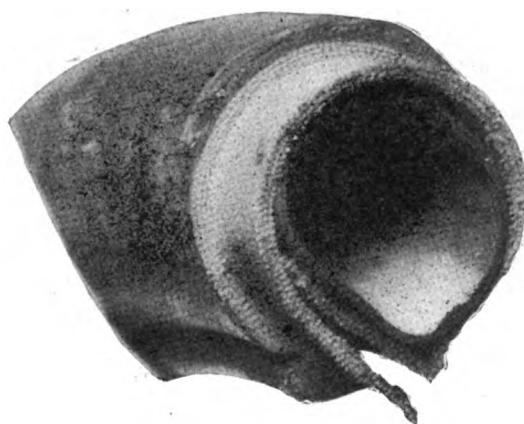
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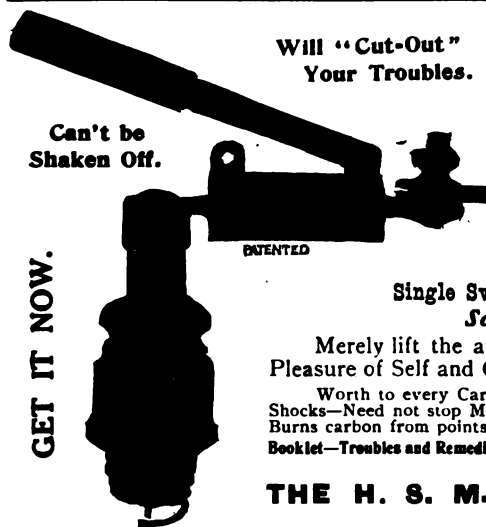
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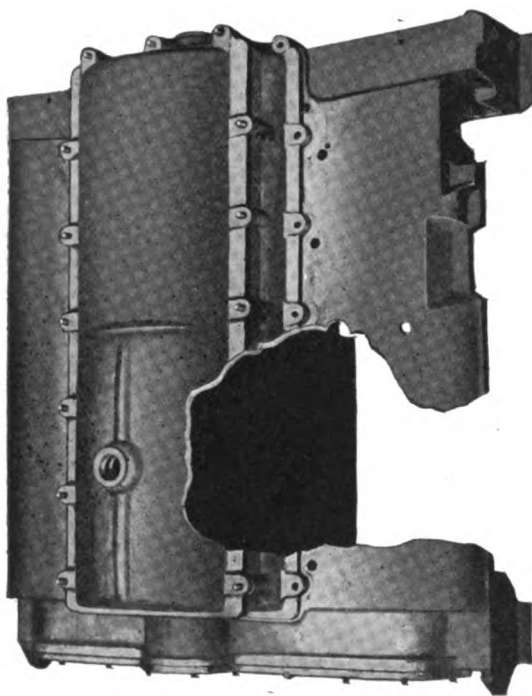
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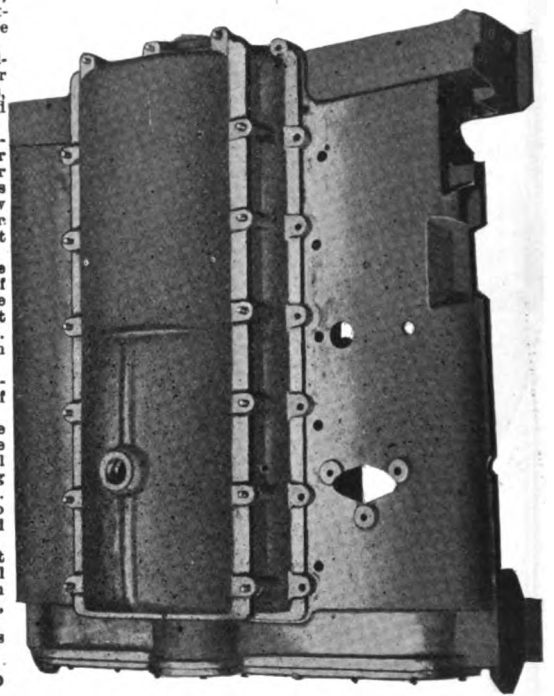
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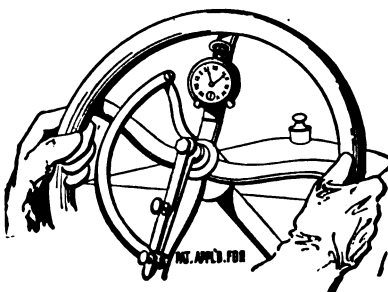
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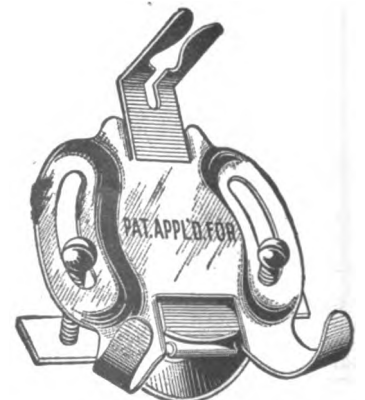
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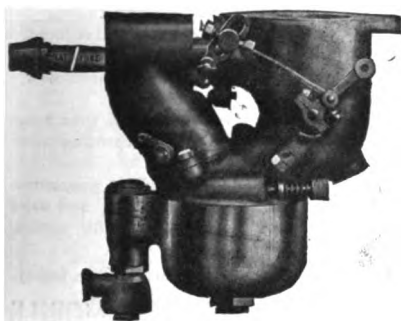
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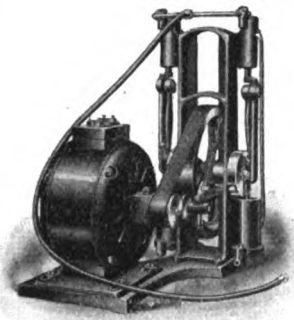
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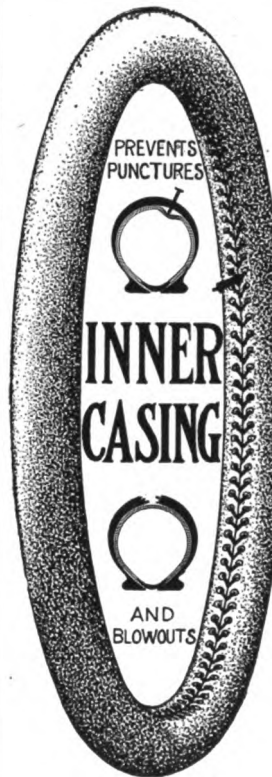
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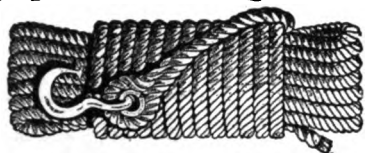
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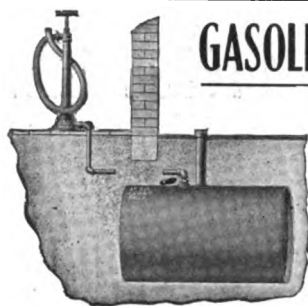
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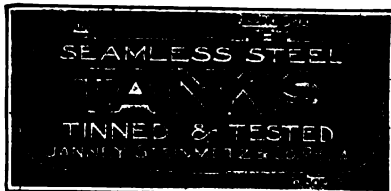


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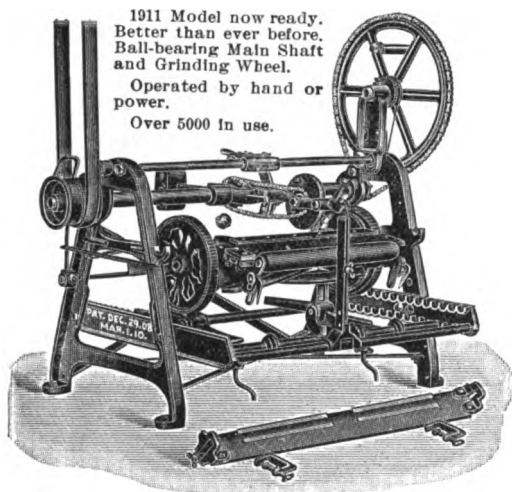
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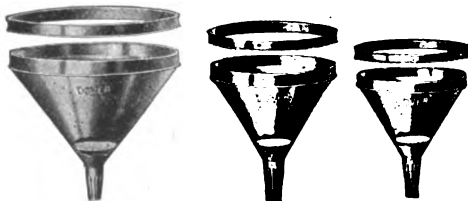
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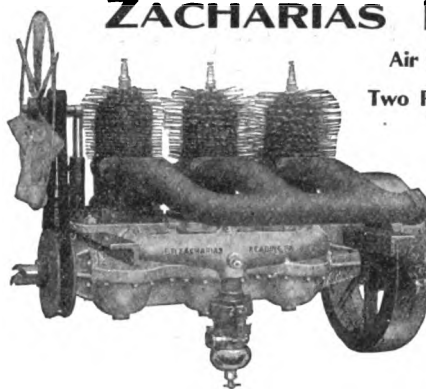
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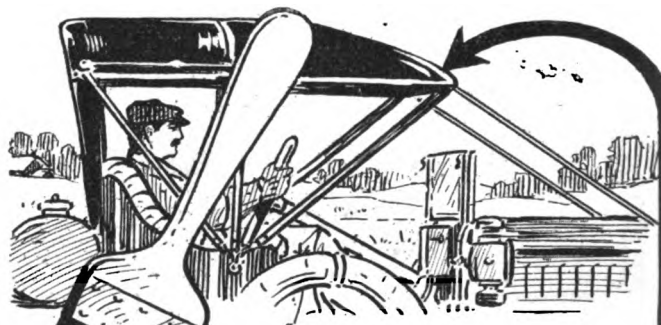


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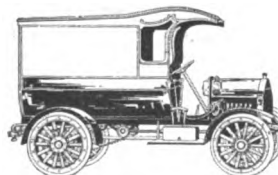
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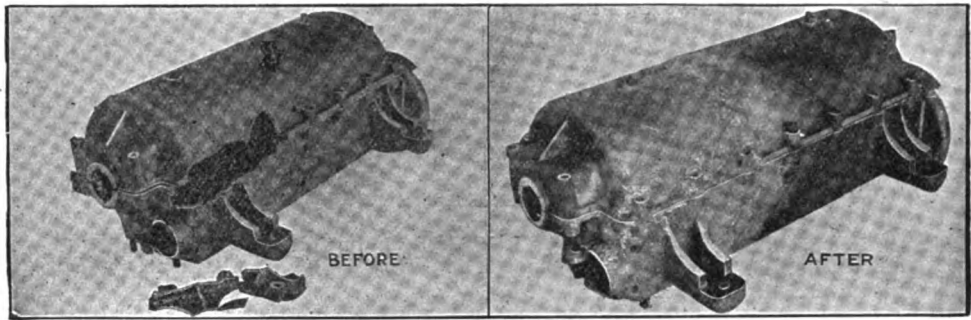
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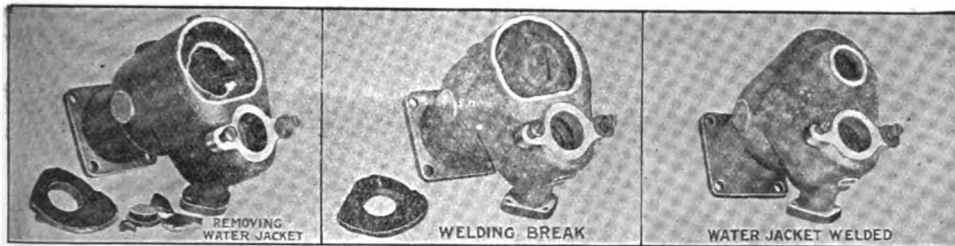
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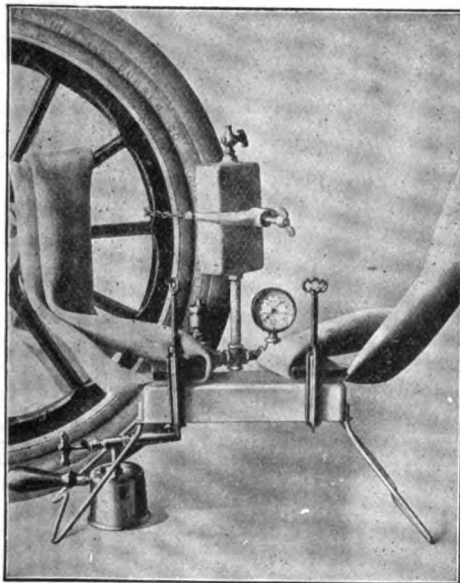


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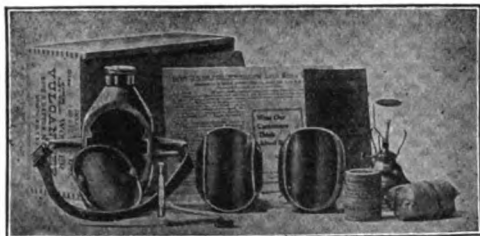
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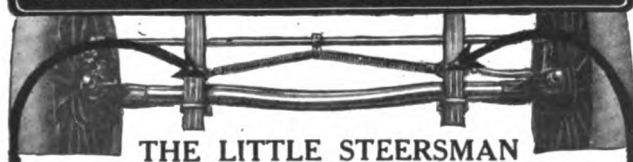
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**EASIER, SURER
CONTROL IN STEERING**



THE LITTLE STEERSMAN

is a coiled spring made of oil tempered steel wire. It fastens to the front springs and steering rod of an automobile, becoming an auxiliary of the steering gear. Takes away jar, strain and trembling of steering wheel. Automatically keeps car straight on rough, muddy or sandy roads or when steering gear breaks or tire bursts. Eliminates physical and mental exertion due to guiding the machine. Prevents accidents. Reduces wear and tear on all parts of the car. Fits any car is a necessity to every car. Write for booklet, testimonials, etc. Most dealers have or will get the Little Steersman for you or you can order direct. Get our literature anyway—write now. Dealers—write for prices and discounts on our specialties. The Little Steersman, Elastic non-skid tire chains and Little Lever Hooks. MODERN AUTO APPLIANCE CO., 10 Kinderhook St., Chatham, N. Y.



The POSITIVE



Positive

Lock Washer

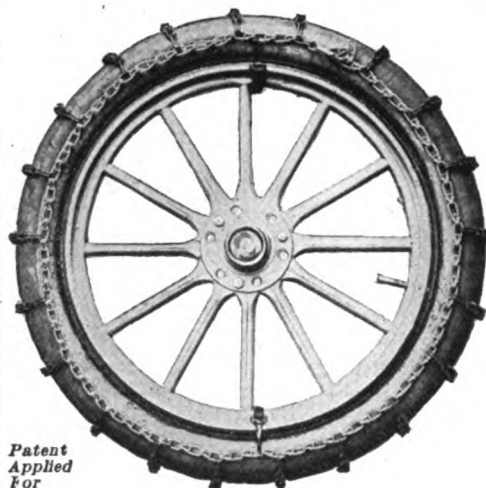
Plain

Made in all sizes and weights for Automobile purposes. Can be used thinner than any other lock washer—effective, no matter how thin. One lock under the nut and head can be used if so desired. Exhaustive tests, covering a period of nearly 18 years on railroad track, drop presses, Automobiles and machinery subject to vibration, have proven its superiority over every nut lock manufactured. Write for samples and price. Made exclusively by the

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For

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BEST
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We claim that we furnish the
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Write us and we will tell you why.

We have an Adjuster that will fit any size chain.

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The exceptional braking power of J-M Non-Burn Lining is due to the fact that it is made of Asbestos—which means a mineral lining against a metal drum. This gives the greatest braking efficiency known to engineering science. Yet, a car can be stopped just as slowly and just as gently with

J-M NON-BURN BRAKE LINING

as with any other lining when brakes are not applied too hard.

And, notwithstanding its greater frictional properties, J-M Non-Burn will not wear out a drum as quickly as ordinary linings, because Non-Burn grips the drum instantly, while most linings allow the drum to turn many times before stopping car, which means a constant rub and wear.

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"Ideal" Inner Sleeve

To remedy a "blow-out," or if applied to a weak spot will keep an old shoe in service.

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Designed to permanently as well as temporarily provide against "Blow-outs" or rim-cuts. An inner sleeve and an outer jacket with wearing surface combined.

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Full Line Auto Tire Repairers' Stocks, Frictions, Tread Stock, Patching Gum, Cement Sheet, etc.
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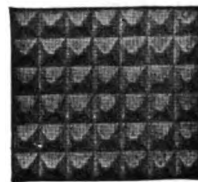
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It will not rust, tarnish nor stain from the effects of oil, grease or gasoline.

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Yet it costs less than good rubber and will last much longer.

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Samples of matting and further information will be sent upon request.

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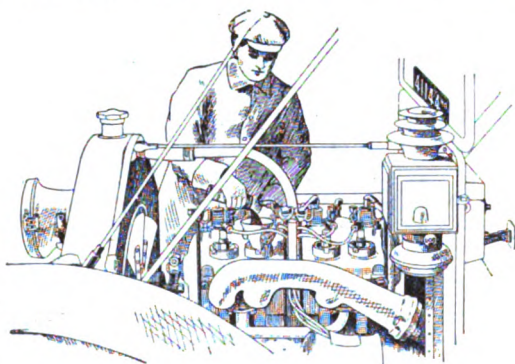


EVERY DEALER, REPAIRMAN AND GARAGE

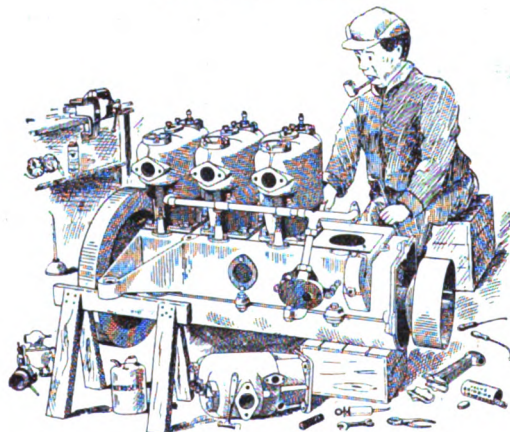
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The Dry Cleaning Cylinder Compound



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THE OLD WAY.

FLASH DECARBONIZER is poured from the can through the spark plug hole into the combustion chamber. The heat of compression vaporizes it and it is blown through the exhaust in a fine dust-like state.

The first illustration shows the method of application.

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THE FLASH MFG. CO.

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The End of Your Spark Troubles

Just Put Them In And Forget Them

If you are looking for a Spark Plug that is always on the job—that will not short or soot over—break porcelains or cause trouble of any sort—get a Set of No. 8

Never-Miss Spark Plugs

Built by men whose "know how"—ends your spark troubles. Have stood the test of seven years. Over a million and a quarter satisfied users. Magneto Type, Regular and Extension Type, open end.

One Dollar For Any Type or Size.

Guaranteed One Year

Every Never-Miss Spark Plug is subjected to the most rigid inspection before leaving our factory—your protection is the strongest guarantee ever made by any responsible manufacturer. We authorize any jobber or dealer to replace any defective Never-Miss Plug or broken porcelain, within one year of purchase, and charge it to us, no matter where bought. This means absolute satisfaction.

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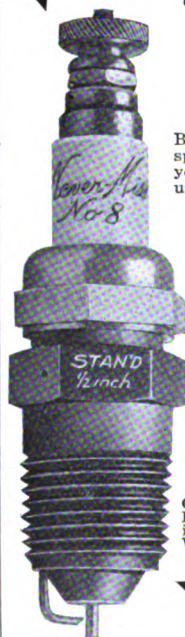
To Dealers Everywhere

Wide awake dealers from Maine to California, have proven Never-Miss Spark Plugs business producers—not to handle them is to miss a genuine live-wire connection. Write today for dealer's proposition.

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In offering "REX" METAL CREAM to dealers we present a metal polish of unusual quality—one that not only cleans and polishes brass, nickel, steel, etc., but also brings out or renews the original lustre of the metal itself.

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OUR WORK IS BEST AND
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HUB ALUMINUM WELDING COMPOSITION
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ON RECEIPT OF \$1.50 WE WILL SHIP YOU A LARGE STICK
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Keystone Grease was used exclusively on the Maxwell Car which recently covered ten thousand miles of Road Travel without stopping the motor.

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Keystone Motor Oil is a cylinder oil of the same high standard as Keystone Grease. It holds its body, feeds properly at all temperatures, maintains a perfect oil film and burns up clean.

Keystone Motor Oil is the only lubricant that will not deposit carbon under any cylinder heat, and that will not decompose or lose its necessary viscosity in any working condition.

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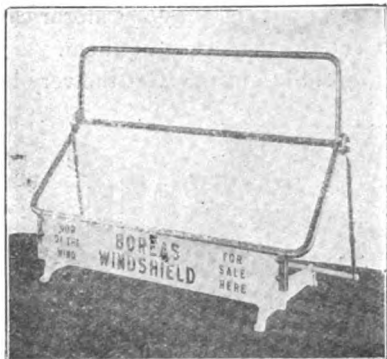
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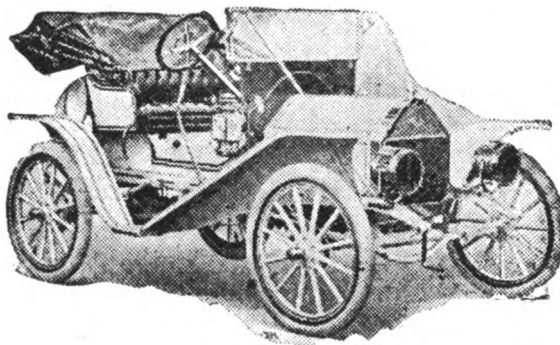


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38 in. Plate, \$20.00	38 in. Plate, \$25.00
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The Car That Is Always Ready To Go.

SPEED, STYLE, COMFORT—All at the price you can pay and with an upkeep expense that you will not feel.

\$500.00 buys this car just as shown in cut, fully equipped, with top, curtains, slip cover, gas lamps, generator, oil lamps, horn, brass automatic wind shield, speedometer.

Here is a really high-class two-cylinder car; water cooled, shaft drive, 8-inch tires, Schebler carbureter, Atwater-Kent Unisparker, pressed steel frame, 80-inch wheel base.

The Agency for this car will make you money.

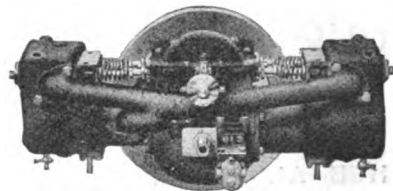
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1910 STYLE

Makes a hit wherever used on account of its power and compactness.

Can be placed in any car from the small Olds Runabout to the larger sized cars.



Made in two sizes:
10-12 H. P. and 18-20 H. P.
Water Cooled.

Write to-day for Circular and Prices.
Simplest and Strongest Motor Built.

Beilfuss Motor Co.
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Handy Lamp

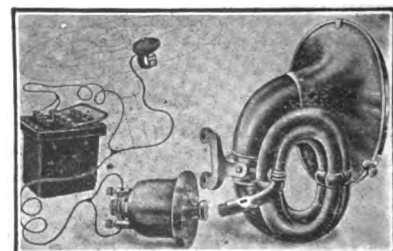
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SYSTEM**



Draws Trade to Your Shop.

Gives a 300 Candle Power Shadowless Light the instant you move the lever. Turns up or down, like gas, burns dim when not in use, or can be turned up instantly when more light is needed. It floods a 30 foot space with a brilliancy like daylight. Far cheaper than gas, kerosene or electricity, and so simple that anyone can use it. You can depend on it for years for any purpose demanding a big, strong light. Catalogue A.B. tells why. Send for it now.

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Write for Bulletin No. 31
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A True Money Saver and a Protection to Life and Limb.*



RUBBER PUTTY

Prevents blow outs, avoids sand blisters, saves fabric from decay, keeps out water, causes tires to wear out evenly and smoothly.

Requires no cement, will vulcanize itself, is applied in 5 minutes, does not soil the hands. Saves over \$50 in the season, gives safety in speeding.

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REX SPARK PLUG

**KING OF PLUGS.
FOR MAGNETO
OR BATTERY.**

Simple Construction.
Hot Spark Absolute.
No Short Circuit.
Sootproof.
Highest Grade.
Hardfire Porcelain—
Specially Designed.
Guaranteed to withstand the Heat.
Electrode, Meteor Wire, which cannot burn out.

Packing, Copper Asbestos Gasket. All Sizes.

Metric, Half-inch, A.L.A.M. and Motor-cycle.

**SATISFACTION GUARANTEED.
Interchangeable Porcelain.
REGULAR PRICE, \$1.00**

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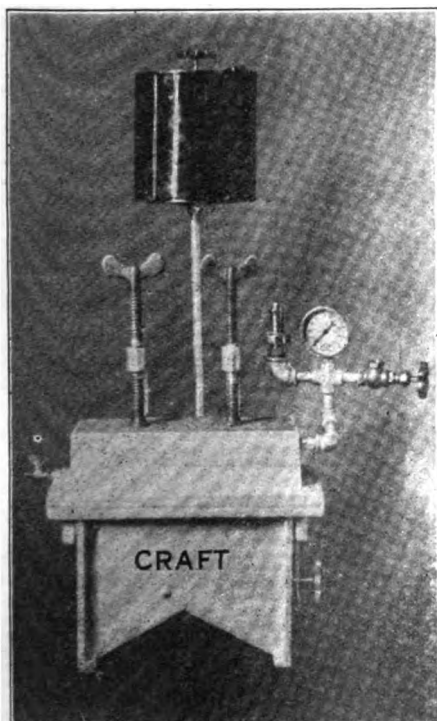
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SAVING MONEY
Enclosed find \$2.00 for four Rex Spark Plugs. Size Thread. Name of Car. Address. Name. Spark Plug.

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We will send set of four plugs for \$2.00—just half price—to any reader who will cut out above corner coupon and send in with cash.
Be sure to give size of thread and name of car.

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Two tubes every fifteen minutes and no danger of burning them up. Any break-up to the length of eleven inches in one cure. This machine will do all the tube work in any garage in the United States. Fitted to use with gas or gasoline and sold for \$25.00, cash, with your order. This vulcanizer is not sold through any dealer or jobber in the U. S., but sold from the makers only.

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Oldest Manufacturers of Vulcanizers in the Northwest

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TRADE MARK

The Peerless Auto Body Polish

It is simply invaluable, not only for the body, but for leather cushions and tops. It is the only material that has this combination; you can use a leather cushion immediately after using it. It will also clean all brass fixings that are connected with the wood, without injury to the latter.

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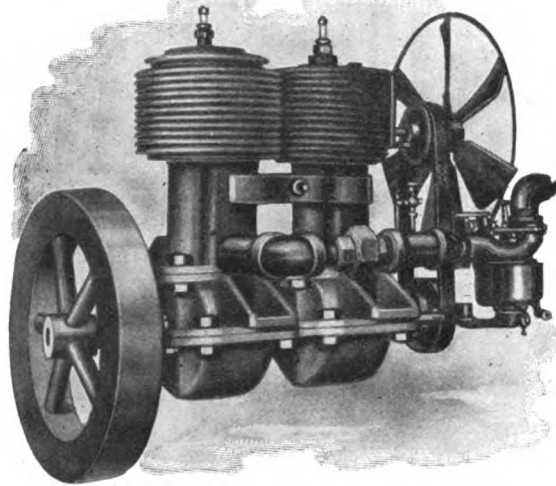
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No matter how good your power plant, we can improve it

Sate
Simple
Reliable
Economical



10-12 H. P. Air Cooled Motor. Weight, 138 lbs.

More reliable than a four cycle engine. Surer to go and quieter. And the price! We can astonish you and help you to meet all competitors.

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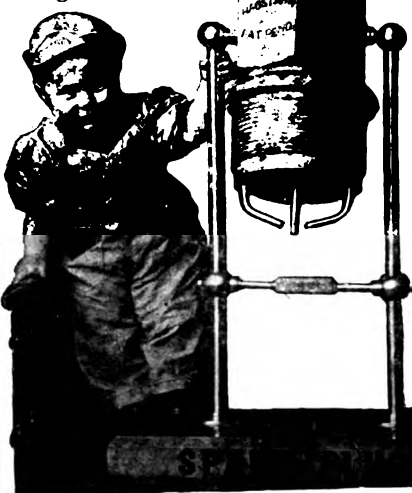
CLIMAX ELECTRIC WORKS New Salem, Mass

HAGSTROM

SPARK PLUG

BLOWOUT PATCH

You know that the much talked of Hagstrom Porcelain Guard makes a difference. Next time you have Spark Plug trouble put in a set of "Hagstrom's."



Now adopted by manufacturers of the highest grade of American cars as their 1911 emergency tire equipment.

For further particulars write at once to

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TUTHILL SPRINGS for Automobiles THE BEST MADE.

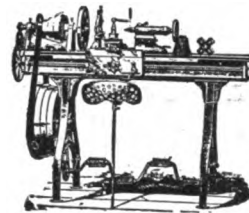
TWO GRADES, (1st) Standard, made of finest high carbon Automobile steel; (2nd) Special, made of Vanadium Alloy steel.

We are experts in designing automobile springs.



If you have any trouble with your springs send to us. We have large capacity and can make quick delivery.

TUTHILL SPRING CO.,
758 Polk St., Chicago, Ill.



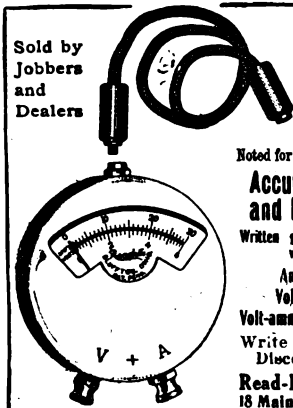
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9' swing
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For Repair Work our No. 13 Lathe is right; has 13' swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with counter-shaft or foot-power.

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**Accuracy, Durability
and Permanency.**

Written guarantee for one year with each meter.

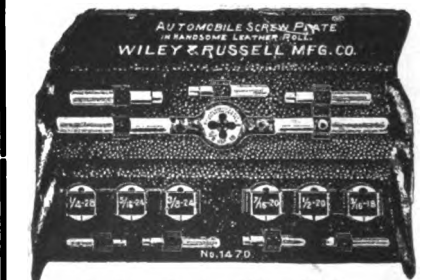
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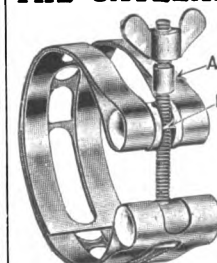
Write for Circular and Discount to Trade.

Read-Rite Meter Works
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Send for Catalog 84F and Prices.
WILEY & RUSSELL MFG. CO.
Greenfield, Mass.

THE CATELAIN HOSE CLAMP

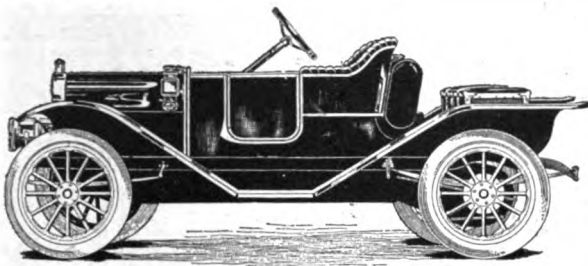


Nothing has ever been created in this line comparable with it. This clamp can be attached or detached in a few seconds. It cannot slip, loosen, or cut the hose, and its strength, owing to its construction of band metal, and the way the ends are overlapped, is simply a perfect clamp, and the price is very low. Let us tell you more about it, if you are an automobile manufacturer or dealer, let us send you one for inspection.

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The Car Ahead."



This Handsome 30 H. P. Roadster \$1,150.

Here's an automobile of the highest type—of large horsepower—of neat conservative lines—and at a price which makes it practical for business and pleasure purposes.

This newest Model H Roadster possesses all of the distinctive Cartercar features such as Friction Transmission and Chain-in-Oil Drive which have made their cars favorites for several years. It also comes as a touring car at \$1,150.

Model L, 35 H. P. Touring car, comes completely equipped with mohair top, envelope, storm curtains, wind shield, speedometer, gas tank, gas lamps, oil lamps, jack, etc., for \$1,600.

Model M, 40 H. P. fore-door touring car with 120-inch wheel base, 4x36 inch tires, with finest mohair top, envelope, storm curtains, wind shield, speedometer, gas tank, gas lamps, oil lamps, tools, etc., at \$1,875.

WRITE ABOUT THESE CARS.

Cartercar Company

"The Car Ahead."

PONTIAC, MICHIGAN



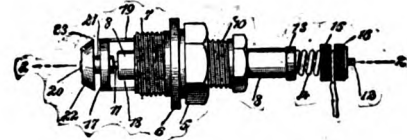
OIL
PROOF



SPARK
PLUGS

PATENTED.

"No Wires to Burn Away or Melt."



Reproduced from Patent No. 812,622,
Applied for March 24, 1902.

BUICK OWNERS ATTENTION

Greenwich, Conn., Jan. 26, 1911.

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Gentlemen:—I have used the "Best" Spark Plugs in a 4-cylinder Buick Car, and find they are the only Plug, out of several, that would give satisfaction. I have used one set of Plugs over 7000 miles without renewing any parts.

Truly Yours, (Signed) ALLEN A. KNAPP.

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Gentlemen:—Since using your "Best" Spark Plugs in my Buick Car I have never had any trouble with oil and do not give them any attention whatever. Previous to using your Plugs I had a great deal of trouble with oil in the cylinders and loss of power. I do not hesitate recommending them to those whom are troubled with Spark Plugs.

Very truly, (Signed) F. C. SWARTZ.

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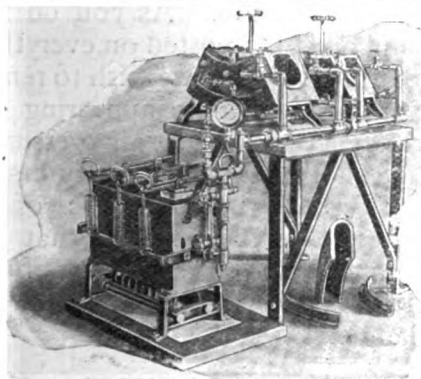
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32x4	14.40	5.00	7.50	50 "
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34x4	15.00	6.00	7.75	75 "
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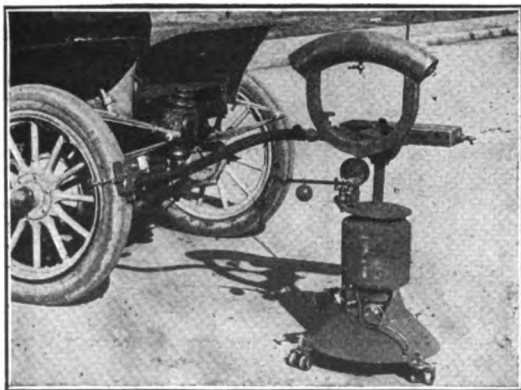
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VOL. XI, No. 2.

NEW YORK, APRIL, 1911.

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Yet This is a Good-Sized Garage with Turntable and is Well Arranged.

From H. H. Root, Ohio.—Since the year 1903, when I began with a curved-dash Oldsmobile runabout, I have been running an automobile, but I have enjoyed the last year more than all the rest put together, principally because I had my own auto-house. One who has always kept his machine in a public garage or in a building not especially adapted for the housing of an automobile, has no idea what solid comfort there

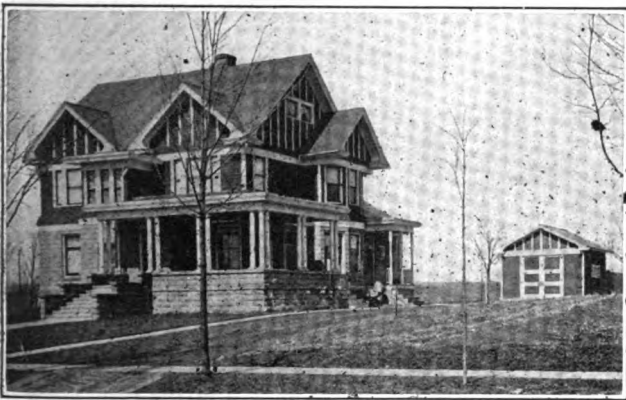


Fig. 1.—An auto house should conform in style of architecture to the dwelling. A high roof structure back of a gable roofed residence seldom looks well.

is in a room especially designed for the purpose. Barns, sheds and the like are very poor places for automobiles, for the dust that collects is bad and the lack of room, as well as the lack of suitable places for tools and paraphernalia brings about, in the end, a great deal of inconvenience.

In considering the building of an auto-house, I made up my mind from the very first that I wanted a turntable, for six or seven years' experience in backing down a long driveway or backing out of a shed and turning around, taught me the very great value of such a convenience, and so the building was designed in such a way as to accommodate a turntable for as large a machine as I ever expected to own. Twice, in backing out of a building, I collided with a wagon and once my brother backed into a man, knocked him down and nearly ran over him. All this made me more desirous than ever of turning around before leaving the building.

Material Used.

The first point to be decided was the material with which the structure should be built. Concrete naturally was suggested first, and I will admit that it has much to recommend it. However, I was considering the expense and on account of the cost finally decided against the concrete. Of course, it is claimed that concrete blocks are no more expensive than a frame construction, but some experience in building my residence taught me otherwise. Then, while I did not expect to have to move the building, I knew that if I

used concrete blocks the whole thing would probably have to be torn down if moved. Most people believe that a building that holds an auto should be fireproof, but I cannot see any advantage in this. Such a building is very unlikely to take fire from the outside, and, since even in a fireproof building benches, shelves, etc., cannot very well be made fireproof, I fail to see why a frame structure is not just as safe, at least for a private affair, holding only one machine. If an automobile takes fire it will burn up whether it is in a fireproof building or not; and, as far as the storage of gasoline is concerned, if proper precautions are taken, as I expect to show a little later, there need be no danger at all from this source.

How It Was Built.

I believe that an auto-house, like a barn, ought to be in harmony, as far as appearances go, with the architecture of the residence back of which it stands. The oddest-looking buildings I have ever seen have been some of the auto-houses back of well designed homes. The first illustration shows that the auto-house which I am about to describe, conforms to the general construction of the dwelling house. The floor plan of the building is shown in Fig. 2. The length

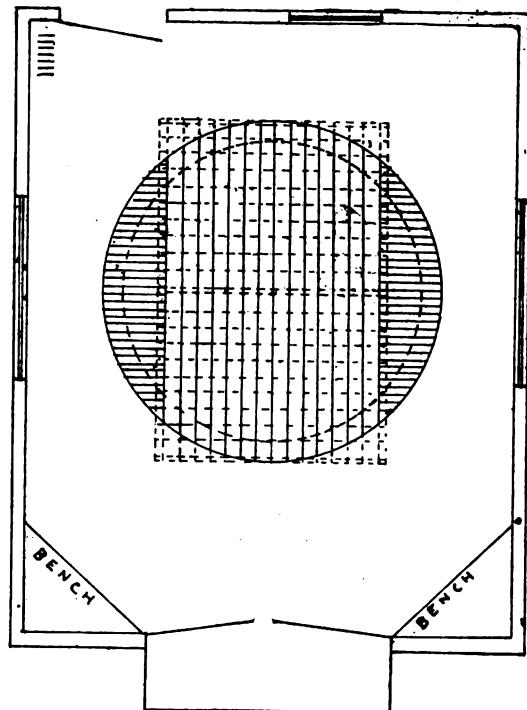


Fig. 2.

is 20 feet and the width 16 feet inside measurement. The windows on each side are 6 feet in length and 24 inches high, and the one window at the rear has two sash, each 24x26 inches. The large doorway in front is 8 feet wide by 8½ feet high, while the single door at the rear is 3½ feet in width.

The diameter of the turntable is 11 feet. For the very best results the table should not be very much

larger than necessary, for the proper way to turn a machine is to stand between the front springs, as shown in Fig. 3, grasping both spring supports, so that the operator can push with the left hand and pull with the right, and if the platform is so large that one has to lean over to reach the springs, the work is much more difficult as well as awkward. My machine has a 100-inch wheel base, but there is room on a 11-foot turntable for a 112-inch machine.

The foundation of the building, instead of being solid, is made up of ten piers; one at each corner, one in the middle of each end and two for each side. It would probably be cheaper in the end to make a solid wall of concrete for the foundation and thus obviate the necessity of heavy sills. In this building 6x8 sills rest on the piers and complete the foundation. On these the studding of the walls is toe-nailed. Ordinary drop siding was used on the studding.

The best quality of slate was used for the roof. The cost could be reduced considerably if some roof-

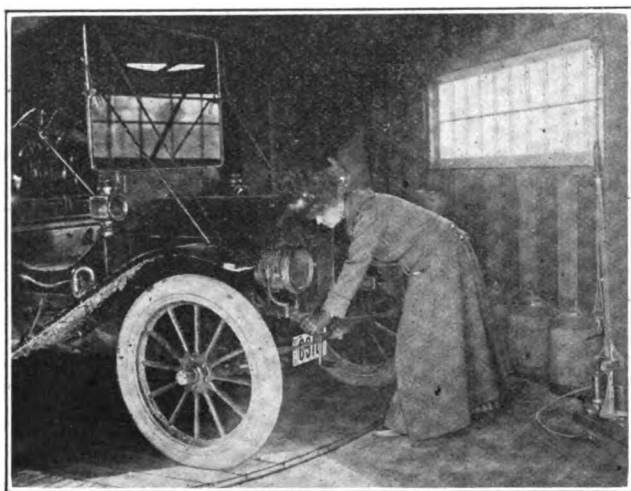


Fig. 3—By pulling on one spring and pushing on the other, the car is very easily turned around.

ing paper were used, but a good slate roof is a good investment. Seven-eighths inch roofing boards were nailed solid to the rafters, for, in my opinion, it does not pay to put as expensive a roof as slate onto narrow ribs. The roof of a building is a poor place to economize, anyway. With a good foundation and a good roof almost any building is a success.

In regard to the expense of the building, I expected to keep it under \$200, but ran over this amount slightly. In round numbers the cost of the material and labor was as follows:

Lumber	\$75.00
Slate	40.00
Labor	40.00
Cement and sand	20.00
Steel work and lumber for turntable..	25.00
Hardware	3.00

Some incidentals brought the total cost up to about \$210. Judging from my experience in building my residence, I estimate that the same building with walls of concrete blocks would cost about \$250. I certainly would not pay the difference for concrete blocks, for nothing can surpass a frame building for convenience in putting up shelves, hooks, benches, etc.

A Turntable for \$30.

The construction of the turntable may be of interest. The platform proper, on which the machine stands, is made of two thicknesses of 1½ inch cy-

press, the grain being crossed for strength. In this platform 20 pieces of cypress were used, 1½ x 6 inch x 7½ feet, and also 14 pieces 1½ x 6 x 11 feet. The drawing and the various illustrations show quite clearly the construction. The long pieces were nailed very rigidly on top of the shorter pieces, a crack of ⅝ inch being left between the two middle under short pieces, to make room for a cross-bar of channel iron supported by the pivot in the center, as will be explained later. The total width of the long pieces is only 7 feet, so the under pieces project 3 inches on either side, this projection affording a good support for the hinged side floors that will be mentioned later. After the cypress boards were firmly nailed together and the nails clinched, an 11 foot circle was struck and the corners, as shown by the dotted lines, sawed off, care having previously been taken that there should be no nails so close to the circumference as to interfere with the saw. This platform thus prepared was left standing on edge at one side of the building until the support for the pivot and the eight rollers could be put in position.

Fig. 4 shows plainly the general plan of the steel work. The outside hinged floor is shown turned up against the running board of the machine, exposing the track and rollers. Fig. 5 is a closer view of one of the rollers. These rollers are 8 inches in diameter, with 2 inch face, and a ½ inch flange is cast on the pulley. The hole in the hub of the pulley is just right for the ¾ inch steel shaft on which it runs. It should be noticed that the track is solid with the turntable and moves around, therefore, on the pulleys, which remain fixed in position. Close to the end of each ¾ inch shaft on which the pulleys turn, a ½ inch hole is drilled, these holes being in line, and a long ½ inch bolt, AA, Fig. 5, extends through this ¾ inch shaft down through the hardwood block, BB, 5 inches thick, into a foot and a half of concrete underneath. The bolts, AA, are not separate at all, but are really the two ends of one long rod bent in the shape of the letter U, this construction being much more rigid than two separate bolts.

The pivot of the table is a piece of 2 inch steel shafting, 18 inches long. A ½ inch slot was cut in one end of this piece of shafting, as shown in Fig. 6, to a distance of 3½ inches, to accommodate the piece of ½ inch x 2 inch channel iron, 6 feet long, before mentioned. This pivot has for its bearing a piece of 2 inch galvanized pipe with a cap on the lower end, imbedded in a foot and a half of concrete. Before the pivot was put in, a liberal amount of grease was pushed down into the pipe, so that the bearing might have ample lubrication. As the pivot extends up through the platform it is possible to run oil down the side and thus give further lubrication, should this be necessary.

The steel track was made of ½ inch x 2 inch channel iron, two pieces being bent in the form of a semi-circle with a radius of five feet. Two holes were drilled 3 feet from the center of each piece of the track, through which bent bolts could pass, later, up through the woodwork, thus securing the track rigidly to the platform. The two halves of the track were firmly clamped together, as shown in Fig. 4 C.

Before the rollers were in position, or the concrete put in to hold the bolts, the pivot was placed in its socket, the channel iron cross-piece put in the slot and the platform carefully lowered on it by means of a rope and tackle. One-half inch bolts, 5 inches long, were given a right angle bend near the head, and then pushed through the holes in the wooden platform drilled at the right points. A large washer was put

on and a nut turned down, thus drawing the track very firmly up to the platform, making it absolutely rigid.

The platform was blocked up until it was perfectly level and the four rollers along the flat sides were wired to the track with the shafts, bolts and all in position. Concrete was then poured into the holes under the rollers until it reached the hardwood blocks.

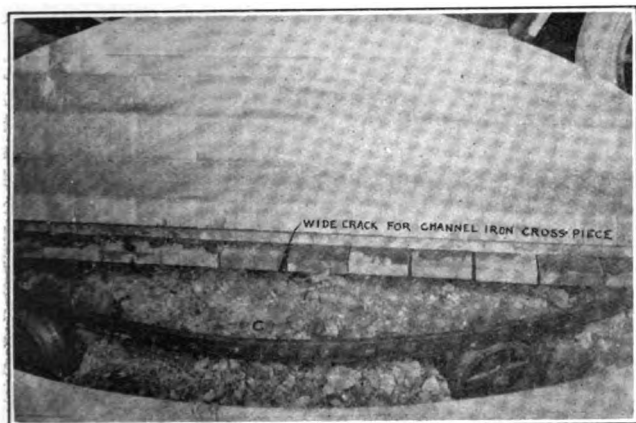


Fig. 4—One side of the hinged floor pieces turned up against the running board of the machine to show construction underneath. The channel iron track revolves with the table.

After twenty-four hours, the blocking under the table was removed and the platform turned one-quarter around, the other four rollers similarly wired in position and the concrete put in. Leveling up the rollers by means of a surveyor's level, after two or three days, then completed this part of the work.

The only thing left was to make the curved side pieces hinged to the main part of the turntable, as shown in Fig. 4. These complete the circle, and since they never hold any great weight, ordinary $\frac{7}{8}$ matched flooring is strong enough. When these pieces are turned down in position, they rest on the channel iron track. The object of having these hinged to the main part of the platform is to permit of easy inspection and greasing of the track and rollers.

If 8 inch pulleys could be obtained that had a 4 or

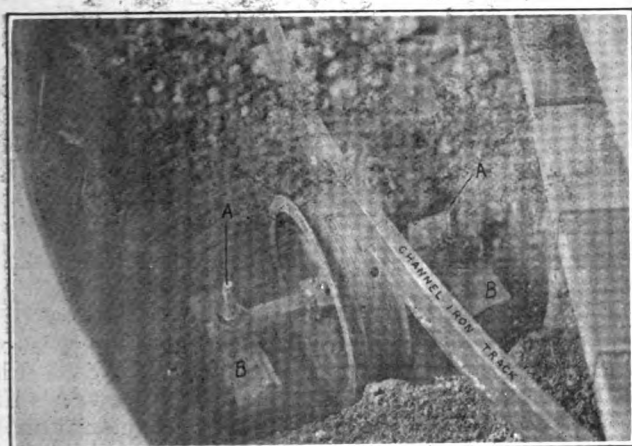


Fig. 5—Detail of one of the eight rollers. A, A, are the two threaded ends of a long U shaped rod imbedded in concrete. B, B, are hard wood blocks through which the bolts pass that support the roller shaft the proper distance above the concrete below.

3 inch face, there would be no object of having the flanges, but since such wide pulleys would be more expensive, it is best to adopt the construction as shown. Notice that these pulleys are not limited in their movement on the $\frac{3}{4}$ inch shaft except by the

flanges. It is difficult to make so large a hoop as this channel iron track must be, a perfect circle, but any irregularity is taken care of by the movement of the pulleys as they slide back and forth on the shaft. This sliding motion also prevents any great tendency to wear or cut. The turntable as described has been in use over six months, a 2,400-pound automobile being turned around on the average twice a day, and yet there is not a particle of wear on the rollers. At the same time, the machine turns so easily that after a few steps a good strong push will send it clear around, facing the other way. Usually, however, the operator walks along between the springs, as shown in Fig. 3, stopping the table, when the mark on the floor is reached, showing that exactly one-half revolution is accomplished.

In order to put in the concrete floor, two or three dozen blocks of wood were obtained about $\frac{3}{4}$ inch square, and perhaps 2 or 3 inches long. Enough thin lumber, about $\frac{1}{4}$ inch in thickness, was used to reach clear around the circle, and with the small square blocks as spacers, the thin stuff was nailed around the table, first securing the latter firmly so that it could not turn. This thin stuff made the inside form, and provided a proper space between the table and the concrete. After the concrete had set for two or three days, the blocks, before mentioned, were driven

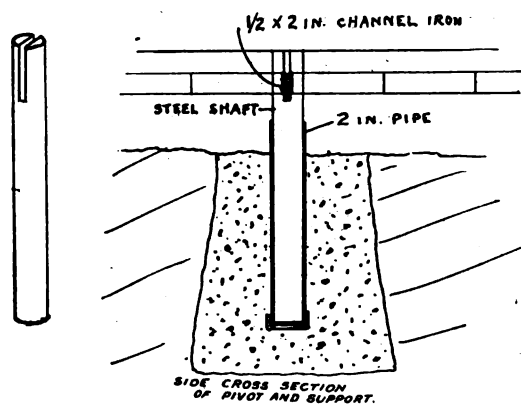


Fig. 6.

down through with a mallet and wedge and the $\frac{1}{4}$ inch board removed.

Fig. 7 shows the great disadvantage of the old way of backing out of a building. There is always danger of running into something, and especially in winter when there is snow on the ground, it is very difficult indeed to keep the track. Last winter I plowed through deep snow out to the street where it would have been impossible to have backed out or turned around outside the building. It is certainly a great relief to come out of a building front first. As I said before, one who has not had actual experience cannot appreciate the very great convenience of a turntable and when one can be put in at a cost of not over \$30, at the very most, there is no reason why any automobile owner cannot have one.

Some Little Conveniences.

Fig. 8 is an interior view of the building. The tire-pump is shown at the right. These pumps are very satisfactory and require very little effort if screwed fast to the floor. One tire after another can be turned around to within 3 feet of the pump. I like to give my tires a little air about once a week, for, even though they do not look flat in the least, I find that the pressure gauge reveals a slow, but steady loss of air even from a new inner tube. Tires certainly

last much longer when kept pumped up to the proper pressure.

The most practical way of handling gasoline that I ever have found is by the use of wooden-jacketed 5-gallon cans as shown, with funnel-top and cork. Such cans last for years, and unless one has an expensive underground tank (a cheap one is worse than nothing), they are by far the best containers for gasoline. These cans may be picked up and the gasoline put into the tank in the machine with very little effort. There is also no danger of spilling the gasoline.

Just above the gasoline cans hanging from a nail

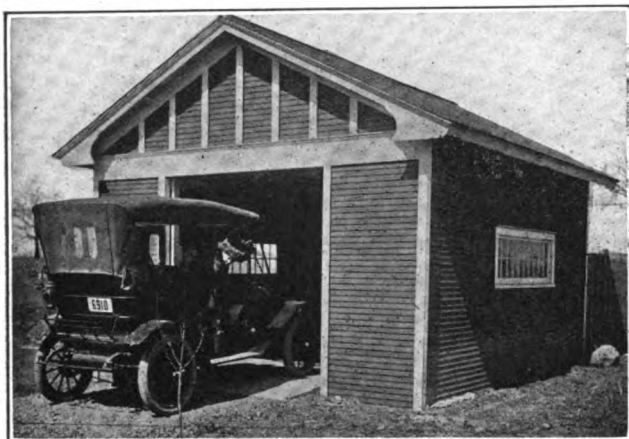


Fig. 7—Before making a turntable the car had to be backed down a long curved drive, which was awkward and difficult, and utterly impossible when the ground is covered with snow.

is a pail, which has only a chamois skin bottom. It is set inside a shallow flat funnel and the gasoline may be poured in rapidly without any danger of running anything over and still all of it must run through chamois skin before reaching the tank.

In the further corner of Fig. 8 is seen a sack of waste hanging from a nail. It hardly pays to bother with old rags when waste can be bought so cheaply. Underneath the bag is a metal box into which all waste is put after it has been used, even though there is but little oil on it. A couple of years ago, a boy was cleaning the machine and he left a piece of greasy waste lying on a bench. Several hours afterwards someone smelled smoke and on investigation found that a deep hole had been burned in the top of the bench, by fire resulting from spontaneous combustion. Greasy waste should always be kept covered up in a metal box. It is not necessary to throw away a piece of it as soon as it has been used once, for it can be kept in the metal box and used as often as required and thrown away only when it is too greasy for further use.

At the front of the building at the right is the water faucet with hose always attached, so that when the machine is run up to the building covered with mud it may be washed at once just outside the door and then run in on the turntable for wiping off, etc. Just above the lock is a cord leading to a switch above the door. This turns on or off the lights in the building and will work equally well for any position of the door. There are three lights, one of them on a long cord, which is ordinarily pulled up out of the way by means of a string running through screweyes over to a weight by the wall, which weight keeps the surplus cord up out of the way, and yet when the light is needed it may instantly be pulled down to any point desired.

To the left, down in the corner, are two jugs. In the winter I no longer use alcohol in any form in my cooling solution for I dislike the smell, and, since the

alcohol must evaporate first, constant testing must be made. I find that equal parts of glycerine and water will not freeze except when the temperature gets down below zero. There is no objection to this solution, although some have thought that it would injure rubber tubing. In most machines that are built nowadays there is very little tubing—however, in my machine, although the glycerine has been in contact with the tubing for two whole winters, I cannot see that it has had any bad effect whatsoever. The only real objection to glycerine is its cost, but the first cost is practically the only expense, as it can be drawn off in the spring, filtered and kept until the next fall. The two jugs shown hold the solution until it is wanted again at the approach of cold weather. When it is put into the circulating system it is usually found that a couple of quarts or so more liquid are needed. The hydrometer is used and a little more glycerine or water added as required.

At the back of the room is a door leading out into the chicken-yard. At the extreme left is a steam radiator, the steam being piped from the house, which keeps the building, no matter what the outside temperature, always above the freezing point. I do not like to have the room kept very warm, for the tires certainly deteriorate rapidly in a hot dry place. The ideal temperature is about 40 degrees. If the room gets much warmer than this I turn off the radiator.

Just above the radiator, on a shelf made for it, is a 5-gallon tank of lubricating oil. Kept above the radiator in this way it never congeals, but is always thin enough to pour readily.

At the back of the building is shown a ladder, which leads up to a loft overhead. A floor was laid over a part of the braces to the rafters on which is stored supplies not often used, thus leaving the main floor

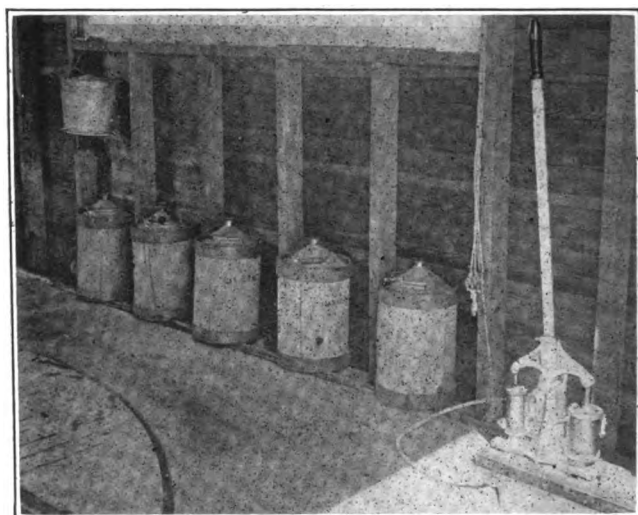


Fig. 8—Five gallon wooden jacketed cans make the best containers. They last practically forever and there is no danger of leakage.

below free from a lot of paraphernalia that is only in the way. It is astonishing what a lot of things will accumulate around an auto-house in a year's time.

The automobile shown in several of the engravings has a friction transmission. A great many thought I was foolish in getting this form of drive, but I have never regretted it though I have now had the machine nearly a year and a half. It will handle the worst hills easily, but what I like about it most is that the motor at all times is relieved of hard work for a speed ratio may always be selected that will enable it to run easily and quietly without working up to its limit.

LONG OR SHORT STROKE.

Views of Car Manufacturers Upon a Widely Discussed Subject.

We have in hand quite an exhaustive and interesting article from Mr. C. J. Pembroke on the long and short stroke motor. It is reluctantly carried over until our next issue on account of lack of space. Meantime, as shedding some light upon this much discussed subject, below will be found replies of manufacturers who have courteously replied to a letter of inquiry concerning it.

From the Corbin Motor Vehicle Corporation, New Britain, Connecticut.—We are this year making both long and short stroke types, using the short stroke motor in our smaller h.p. car which we have used very successfully for the past three years.

In defense of the short stroke motor, would say that gasoline motors are not like steam, relying on the slow expansion of gas, but are impulse motors where the pressure is very high for a short time and after that can be practically neglected. The piston traveling an equal distance in the same time revolves the crank further in a short motor, thereby giving more power. The short stroke motor has shorter connecting rods, lower cylinders, smaller crankcase and lighter flywheels, all of which saves weight. The lower cylinders give a lower centre of gravity, another important feature. The vibration is less with a short stroke motor, because each impulse is applied with a smaller lever arm. For the same reason the strains on the transmission, universal joints and bevel gears, are less like the blows of a hammer. Other advantages of the short stroke motor are that it cranks easier, is more economical of gasoline and because of its smaller piston displacement accelerates quicker, and is capable of higher speeds.

From the Hudson Motor Car Company, Detroit, Michigan.—We note that you say there seems to be a good deal of diversity of opinion as to the merits of the long and short stroke motor. There always has been this diversity of opinion and we presume there always will be.

The start of this last long-stroke movement may be traced to the construction a couple of years ago of several foreign small-bore racing motors with abnormally long strokes. Such extremes as 4-inch bore by approximately 10-inch stroke were used. These motors naturally developed wonderful power because of size of valves and tremendous piston speeds. They were commercially impossible and the regular product of the concerns producing them embody today stroke and bore proportions which are not at all unusual.

Some of the makers in this country employing motors of a bore of possibly 4 inch and a stroke of 5 inch have begun to launch publicity as to the wonderful merits of the long stroke motors. As a matter of fact, there is nothing new in such bore and stroke relation. 4x5 motors and 4½x6 motors were among the first gas engines built in this country for automobile use. Motors of these proportions have been built ever since and cannot properly be termed "long-stroke motors" in the sense in which this term has been used abroad.

Our own idea of the matter is that there are a great many other elements which enter even more seriously into the problem than do the exact relations of bore and stroke. The motors at present built by the Hudson Co. are 3¾ inch bore by 4½ inch stroke, and 4 inch bore by 4½ inch stroke respectively. We

consider these proportions very good. We consider that they avoid any extreme of practice and we know that such proportions give for average commercial service better results than do the extremes in either direction. We have had experience in construction of some thousands of motor car motors wherein the bore was greater than the stroke. We have had experience with an even greater number of motors wherein the bore to stroke relations were in proportion of 4½x6. We have built "square" motors, in which the bore has been equal to the stroke, and the fact that we have settled down to a bore and stroke relation within the limits of 1 to 1 or "square" and of about 1 to 1¼, outlines our attitude quite plainly. We prefer to avoid extremes.

From the White Company, Cleveland, Ohio.—Every White car on the market is demonstrating the advantage of the long-stroke construction, because they are doing everything that can be done with any car of any rated capacity, and are doing it at a lower cost for gasoline and oil.

We have unquestionably the most economical engine on the market to-day, nearly every owner getting at least twenty miles on a gallon of gasoline. It is a question of cubical contents. Cubical contents of cylinders are compared by squaring the diameter and multiplying by the length. As a result, a one-inch cylinder with a three-inch stroke has just one-fourth the cubical contents of a two-inch cylinder with a three-inch stroke, while a two-inch cylinder with a three-inch stroke, and a two-inch bore with a four-inch stroke, have a ratio to each other of twelve to sixteen. In other words, one inch in length only increases the volume one-fourth, while an increase of one inch in diameter increases the volume four-fold.

It is the old question in firearms: A Derringer revolver with a one-inch barrel has neither accuracy nor is dangerous thirty yards away. It has neither direction nor penetration. A six-inch Colt barrel, shooting the same cartridge, will have both accuracy and penetration at fifty yards. It is length of barrel in firearms; it is length of cylinders in gasoline engines. Of course there is a limit beyond which the increase of stroke does not proportionately increase the power. It is limited to the expansion of the gas. Where the length of stroke is about one-third greater than the bore, engineers figure the greatest possible power is developed, every atom of the gasoline being used in the production of power.

From the Brush Runabout Company, Detroit, Mich.—Relative to our experience with engines having the stroke relatively long in proportion to bore, will say that during the past four years we have been steadily lengthening our stroke, starting with a 4x4 engine, we built next a 4x4½, and finally a 4x5, the goal sought at all times being the economical development of maximum power consistent with minimum vibration and weight in a single cylinder motor.

Of course factors other than the relation of bore to stroke have been considered. It is quite evident that other things being equal, the vibration of a long stroke motor is greater than with the shorter stroke. However, the performance of Brush cars in economy, reliability and endurance contests testify that we have progressed in the right direction.

A good road is rather to be chosen than great ditches.

CAR INSPECTION.

Constant Vigilance the Price of Safety and Good Condition.

BY JAMES F. HOBART, M. E.

A wise man once remarked that "eternal vigilance is the price of liberty." He might have said that eternal vigilance is the price of safety and good condition as regards automobile driving and maintenance. It stands both the owner, the driver and the caretaker of a car to keep their eyes everlastingly open to detect, remedy or remove at once the incipient beginning of mis-adjustment, wear of parts and breakage.

A car should never leave the garage without a close inspection of certain parts by someone whose business it is to keep the machine in condition. It may be the duty of the chauffeur or there may be a special mechanic for that purpose or the owner may do it—but someone should look out for the beginning of things and head them off before they become serious.

No car should go out of its garage in the morning without first having certain parts looked over, and "the morning inspection should be done the night before." That is, instead of waiting until ready to take the car out, do the little inspecting trick as soon as it comes in.

It takes no longer to do this—frequently not as long, and, the machinery being warm, the inspection often reveals little things which do not show as readily when the car is cold in the morning. The inspection may well be accompanied by the necessary cleaning operations, and no man who has ever had to do with an automobile but knows how much easier dust and dirt are removed when they are fresh and the machinery warm, than after everything has become cold and the mud has set fast.

But, regarding that inspection business: The very first thing should be the tires and their condition. Whether sufficiently inflated—if undue wear is becoming apparent, rim cutting or fresh cuts in the outer covering which may lead to serious tire troubles if not immediately attended to. And, in connection with tire condition, remember that, all things being equal, the tire lasts the longest which is kept the cleanest! There is no getting around this fact, hence, take advantage of it!

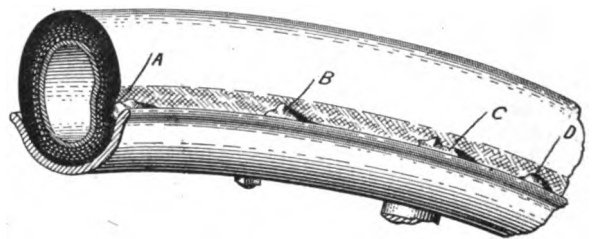
One of the next things to receive attention, is the electrical connections. They must be tight or the car will not do its best work. One of the very best methods of inspection of wiring connections that has come to the attention of the writer is by means of a cell of battery and an ordinary telephone receiver. By putting the receiver to the ear and simply bending slightly back and forth the wire at any connection, the least looseness or movement of the wire in its connection may be heard in the receiver. As an attachment for wiring inspection, the arrangement should be applied as a part of permanent equipment to each and every automobile. It saves a whole lot of time and enables adequate inspection of the wiring to be made in the dark and without attention from the eye. The fingers and the ear do it all. And better still, the device cannot be fooled. If there is a loose connection, the phone will detect it, sure.

Be sure to look in the drip pan frequently. Every time you look at the machinery is a good rule and if you find a lot of gasoline, it is well that you look for leaks right then and there. The presence of grease in the pan should show that too much lubricating oil is being used, that there are not adequate means for

placing the oil where it is needed instead of in the pan. If a lot of dirt is mixed with the oil it shows that the pan is not as close-fitting as it should be and that road dust is circulating freely among the machine parts of your car to their injury.

Look inside the bonnet or underneath the car; keep a most vigilant eye upon each and every bolt, screw and pin. They all get loose and cannot work properly when in that condition. The difference between a noisy and a noiseless car is merely in the amount of rattle or vibration between the parts, and any looseness of screwed connection can only add to the noise made by the car. If you want a noiseless automobile, you must keep a personal eye upon each and every screw and bolt in the entire outfit. Just another case of "Eternal vigilance."

A recent case of severe tire trouble which came to the notice of the writer is shown by Fig. 1, which represents a section of wheel and rim. A bad blow-out occurred at A, the entire tire being split for several inches to B, and laid open almost as cleanly as if cut with a knife. As blow-outs usually occur in the tread of the tire, this occurrence attracted considerable attention and investigation revealed the fact that the accident had been caused by pieces of sharp stone and bits of iron, which had been caught between the tire and the wheel rim and had remained there until



Peculiar tire trouble.

they had literally cut their way through the tire until the air pressure was able to rupture the remaining fabric in the tire. How those pieces of stone and iron got between the tire and the rim, was and still is a mystery. But they got there and spoiled one tire and damaged another before they were discovered. This incident illustrates how important it is to continually inspect and watch a car for incipient trouble which arises in unexpected times and from surprising sources.

The inside of the crank and gear cases needs regular inspection, as does the oil in those receptacles. In ideal lubrication, it is customary to pump oil into all the bearings largely in excess of all lubrication requirements. The oil is returned through a filter which removes the metal dust from the oil and renders it fit for further use. It is not possible to thus circulate oil in the automobile, therefore it is all the more necessary to watch closely the condition of oil which is confined in and around journal bearings and which cannot escape until it leaks out or is worn out. It is quite possible for good oil to become so saturated—yes, that's just the word—just saturated with worn-off bearing metal that the oil cannot fulfil its office of lubricating the wearing surfaces it is supposed to take care of. The writer has seen a number of instances where complaint was made concerning certain oils which were roundly condemned as being "no good" when the entire and only trouble was that the oil had been allowed to remain in the case, with the necessary additions but no cleaning or removal except slight leakage—until instead of lubricating oil in the case, there was a perfect metallic paint. A mixture of oil and finely pulverized steel, lead, tin, copper

and zinc, according to the material of which the bearings enclosed, chanced to be made. Include such things in the garage inspection, and the repair man will not get you as often or as long at a time.

The ethics of automobiling should make it a criminal offence for any car driver to leave the garage without knowing that the entire brake mechanism of the car is in perfect condition. The only way in which he can be sure of this is by constant and thorough inspection. It is not sufficient to hold a light near the brake and hit it a tap with a hammer or give the rods a shake or two with the hand. Inspection means more than this. It means the examination of a brake to see that none of the parts are cracked or bent. It means the setting of the brake lever to determine if wear has prevented the brake from being fully set before the lever reaches the limit of movement. It means the looking inside of dust-guards in order to see the actual condition of a brake, and it means the doing of these things until they become so monotonous that we are apt to neglect them. We must realize that we must inspect as regularly as we sleep, but we must not sleep while we are inspecting automobile parts to ensure our safety and freedom from accident to the life and property of ourselves and of others.

When a man is driving a car along a crowded or well traveled street, he does not always realize that he is guiding a veritable thunderbolt which could deal destruction were its contained energy to be suddenly developed by collision with another vehicle or with a solid wall. The latter is quite possible at any instant through failure of guiding mechanism and of the brake.

A car driven along at a 30 mile clip is often witnessed even in city streets. True, the high rate of speed may be for a very short time, but accident often happens in one of those "short times." In fact, those are the very times where accident loves to appear. Such times are accident breeders, in fact, and we should avoid such bursts of speed whenever possible.

With a car weighing 2,000 pounds, traveling at the rate of 30 miles an hour, or 44 feet per minute, the striking force due to the velocity and weight of the car is roughly, about 60 tons! And this with the stopping of the car within the space of one foot! If it were possible to stop the car in the space of one-tenth of a foot, the striking force would be ten times as great, or 600 tons! If it were possible to stop the movement of the car in a one-thousandth of a foot, the striking force would be about 60,000 tons! What a smash! But it is impossible to arrest the movement of any body instantly, owing to the yield or elasticity of the parts when they come together. Even two hardened steel balls take an appreciable, measurable time in coming to rest if they meet each other head-on as when fired from two cannon. Were it not for the fact that two bodies cannot be stopped instantly, when they meet, it would be possible to destroy the whole earth by dropping a cannon ball upon its surface! Big statement, that, but it can be scientifically backed up! The moral is: Do not get in the way of automobiles and try to stop them suddenly with your body.

Give a little of the daily inspection to the chain and its links, blocks and pins, also to the sprockets upon which the chain runs. Sometimes there is undue wear on one side of the chain which may be prevented by a little adjustment and lining up of the car. Sometimes it helps matters to reverse the chain and let it run in the opposite direction for a while.

The daily inspection must also be relied upon to put a man wise as regards the condition of carburetor, the float, needle valve and particularly the gasoline passage or duct. See that the liquid flows freely into the carburetor and not by jerks or spurts when forced by suction or otherwise. See that the needle valve point is perfect. A point like a crochet hook don't work well in an automobile. The writer has seen this tried aplenty and knows what he is talking about. The float sometimes develops a small hole, fills partially with liquid and becomes "logy." Watch out for this in the daily inspection.

Determine the condition of the gasoline pipe from tank to carburetor occasionally. One case of poor hill climbing was found to be caused by the presence of a smooth pebble in the gasoline pipe. When the car started up a grade, the pebble promptly worked down and closed the opening into the gasoline tank. When the car ran on a level again, the pebble slipped away and permitted plenty of gasoline to flow. A still more serious trouble, of the same nature, was caused by a globule of solder which happened to drop into the gasoline pipe while connections were being made. The globule was almost perfectly pear-shaped and fitted very snugly into an elbow in the pipe. This case was worse than the other for the solder being heavier than the pebble, it would not get away as quickly after the car reached a level again. The driver had all kinds of worry until he chanced to locate the cause of the trouble.

Don't forget the valve stems while making the daily inspection. A bent valve stem is the cause of a good deal of profanity now and then—mostly now, and a bent stem should be detected immediately and taken care of at once. Never run a car with bent valve stems any further than is absolutely necessary to get a new valve stem. Don't try to straighten a valve stem. It can't be done. Apparently the stem will appear to be straight but put it in a lathe and see the minute wobble it has when run at a moderately high speed. No valve stem can work properly when bent, and the attempt to straighten a valve stem merely puts another bend in it. Throw away the bent valve stem and put in a new one. It will cost but a trifle and it makes lots of difference in the running of a car. A whole lot of compression can escape through a valve with a bent stem and as such a valve may stick either open or closed, it may affect both the power and the idle strokes of the engine. Put in a new valve stem before you "monkey" with the old one and then you can experiment all you choose upon the bent stem without danger of future trouble therefrom.

Of course it is not possible to take out and inspect the valve stems every day, neither is it necessary, but see to it that no bent stem remains in your engine, inspection or no inspection. Luckily (or unluckily) bent stems are of very rare occurrence, for which we all are thankful. But when you are inspecting the valve stems, see to it that there are no ribs or lips in or on the valve seats. These ribs or lips are usually found when the valve is smaller than the seat.

The cure is to file or grind off the metal, level with the portion covered by the valve. The wear of the valve upon its seat caused the depression in which the valve seemed to work, and it illustrates very forcibly, the amount of wear which actually takes place in automobile engine valve gear—wear which is not known or even appreciated by the majority of automobile drivers and owners.

While on the inspection trip, give a little attention to the exhaust valves. These do not leak as frequent-

ly as the inlet valves, but there are times when a loss of compression can be traced to the exhaust valves and to nowhere else. It is not a very easy thing to do—the testing of exhaust valves—but a rough and ready inspection may be made by noting if there is any suction (no matter how slight) into the exhaust pipe during the admission stroke and a slight outward but stronger current through the exhaust pipe during the compression stroke. A little dense smoke in the exhaust pipe during the test, will show more plainly the movement inward or outward—if there be any such movement—and when such movement is found, it is prime evidence that the exhaust valve is leaky and needs immediate attention.

New Use for the Automobile.

The automobile seems to be doing about everything nowadays in the way of saving animal and human



Easy hoisting.

muscle. If the man—long since dead—who invented the internal combustion engine, has the power of inspecting things on this earth, as we all hope, and some of us pray, how it must make him chuckle and rub his hands, figuratively speaking, to observe what his genius has done for man. The illustration shows a lazy man's rig, one of Duryea's delivery cars, evidently, where the owner is hoisting some boxes by the use of the engine, the application of power being extremely simple.

AUTOMOBILE INFORMATION.

Mr. Pembroke Concludes His Review of the Construction for Intending Purchasers.

(Continued from the March Issue.)

From C. J. Pembroke, New York.—As both the I beam drop forged, and the tubular front axle have proven their worth, it remains as a matter of choice as to which is better, both having about equal argument in their favor.

The front wheels should be mounted on roller bearings of the tapered variety, because this style of bearing will take the thrusts due to the continual steering much better than will the radial annular ball bearing.

The steering knuckle or pivot should have mounted on its top bearing some form of anti-friction bearing, either a single large ball, which I think is best, or a ball or tapered roller thrust bearing. At any rate, this important bearing, for easy steering should not be of the plain type which is so common especially in cheap machines.

The steering connections are generally so good in any machine that they hardly need discussion here, and could not be discussed without knowledge of horse power, speed, size of wheels, type of axle and other features such as the quality of material used, etc.

Springs.

These should be properly proportioned so as to take care of the small shocks and at the same time not to throw you out of the machine when passing over thank-you-mams, and for which purposes I think that the three-quarter elliptic rear with the semi-elliptic front is good form, but as the full elliptic, both front and rear, gives a very easy riding car, I leave it to the reader to ride in the car and then judge for himself as to the riding qualities.

The maker should be compelled to give a guarantee against the springs sagging or becoming flat during the life of the car, as it is impossible to tell a good spring by simply looking at it or in fact by riding in the car, for it is a matter of how long it will hold its spring or temper, which depends on the quality of steel used and the ability of the mechanic that tempered it.

Frame.

The writer believes that pressed steel of the usual type will pass muster without question, as being standard.

Guards.

Simply a matter of choice, but sheet steel has held its own against the world.

Radiators.

They all look good, but one without serious faults is yet to be made. Most of them will cool the water if of sufficient size, and one make does not seem to require much more radiating surface than the other to accomplish this purpose. They all look as though they would last as long as the car and give no trouble but here is where they are all deceptive, for any of them will give more or less trouble, so it is up to us to see that the one we get can be fixed the easiest when it does spring a leak, and for this purpose those of the honey-comb type, wherein each tube is separate, cannot be equaled, for when a leak does come we simply take the leaky tube out and replace it with a new one, and to do this we do not have to take the whole radiator apart at a cost of from five to twenty dollars, it generally costing not more than two dollars per fix unless several tubes have been injured, such as in a smash up. The fact that this style of radiator is not

as a rule found on cheap cars, shows that their low price is not the maker's object in using them.

Steering Gear.

The worm and gear form is hard to beat when it comes to easy steering, durability and safety. The worm and sector type give the same result except that when the sector becomes worn in the middle due to the continual slight moving of the gear in order to keep in the road, causing much greater wear at this point than at the outer edges where it is used only when rounding corners, turning around, etc., it cannot be turned to a new spot as can the complete gear, which has four separate wearing spots and thus four times the durability. There are several other types of steering gear, all of which have some very good points as well as some very poor, if not dangerous ones, and as I have made clear to the reader my choice I think I have said enough on this subject.

Engine.

Right here is where I get in trouble, for just as soon as I recommend a four stroke cycle, the two stroke cycle advocates will jump onto me, and when I recommend water cooling the air cooled fellows will get busy. When I say valves in the head, then those that favor side pockets will tell you that I am crazy. When I recommend Thermo-Syphon those who think that the pump is necessary will come to the front with their little say. When I say that I think nothing equals the plain babbitt bearing for the crank shaft and that annular bearings are no good for this purpose then the annular ball bearing fellow will say that I have upset the kettle of good dope that I was handing out under other heads. If I dared to tell you that I would not have anything other than a single or unit sparking device with a non-vibrating coil as a battery ignition outfit then all of the fellows who make the timer and vibrating coil outfits would say that I was getting paid. Then if I told you of a magneto that would start the motor on a quarter turn, those whose magnetos must be turned rapidly would say I belonged in the knockers' club.

All this, to say nothing of my expressing an opinion that the long stroke motor is only an excuse for something new in order to get you to throw your old car away and buy a new one. Just the same I am going to stand right up to the rack and say that the valve in the head, thermo-syphon water cooled, four stroke cycle engine with plain babbitt bearings for the crankshaft, with annular ball bearings for the cam shaft, which should be driven by spiral gears running in an oil bath, with the fan in the fly wheel and having the hood and apron practically air tight, is in my estimation nearly ideal, especially if the crankshaft be offset not more than 3-16 in. for each inch of stroke and the cylinders are cast separately.

I also favor the removable head as it permits of easy cleaning out of the soot and grinding of the valves, but in this construction the water should be passed from the lower to the upper part by means of an outside bi-pass and not through openings between the cylinder and the head. This style of an engine should have the overhead cam shaft running in an oil tight, dust tight, consequently sound proof housing, which should at all times be filled with oil by means of a pump circulating system, and when the engine is in operation there should be no moving parts visible except the fly wheel and both the intake and the exhaust valve stems should be at all time properly lubricated. The diameter of the wrist or piston pin should be at least $\frac{1}{4}$ that of the piston itself and a

hardened and ground pin with a hardened and ground bushing in upper end of connecting rod is good, and I question if it can be equaled by any other method now in general use. There should be supplied a means whereby the timer for the battery system can remain idle while the magneto is furnishing the spark, for why should this timer, which is the most delicate part of any motor, continue to run and wear itself out when it is not in use, when it is just as easy to stop the timer as it is to switch off the current? A single jaw clutch, which will engage or disengage the timer, does the stunt. Some of this talk may seem crazy but as I have built and operated a six-cylinder 70 h.p. motor that meets all of these requirements and even some not mentioned I am positive whereof I speak. To say that I favor the six-cylinder motor for powers more than 40 h.p. is but mildly expressing it, and it will be less than three years before we will have self starters as a regular equipment, so why not insist on it now, so that our car will be up-to-date, as cranking a motor is disagreeable at the best and is also dangerous even when the greatest care is used by expert drivers.

We used to think that the gasoline motor and car builders handed us out some very strong claims some three or four years ago as to the power that their motors would develop, but since they have been booming the long stroke motor and trying to get the public in its favor, it's nothing to have them rate a $4\frac{3}{4} \times 5\frac{1}{2}$ four-cylinder motor as being a 50-55 h.p., and one maker goes so far as to call a 5×10 single cylinder motor 44 h.p. at 2400 R. P. M. Just think of it! This would give a piston speed of 4000 ft. per minute and it is conceded by the best engineers in the business that a piston speed of 1000 ft. per minute is as fast as can be successfully lubricated, cooled, etc.

I have seen more than a hundred formulas for figuring horse power of gas engines, but none of them have taken into consideration the compression, bore, stroke, the size of the exhaust ports, piston speed and the speed of the exhaust gases, each and every one of which is an influencing factor that must be considered if we are to arrive at anything like a close estimate of the power produced by a particular motor that might be under question. It is this uncertain factor of all the formulas, that I have seen, which allows the agent to tell you that your way of figuring is all right for most motors, but by reason of his particular motor having extra large valves, very high compression or by reason of its extra long stroke it does some wonderful stunt that ordinary motors are not kin to. They will try to tell you that a long stroke motor is more powerful because it has a greater leverage on the crank, that it uses the gases longer and thus becomes more economical, etc. Thus they try to make you believe that a 4x8 motor is twice as powerful as a 4x4 motor, but they are very careful not to tell you that the 4x4 motor can be safely operated at twice the speed of the 4x8 and still keep the piston speed within a safe limit, they also forget to tell you that with the same compression that the initial or explosive force will be the same in the two motors and that as pressure and volume are constant factors, it will take just as much gas to supply the eight-inch stroke for one revolution as it will to supply the four-inch stroke for two revolutions, and as the expansion of the gas will also be in exact proportion to the stroke, both engines will exhaust at the same pressure, while if the valves are of the same size, for the same piston speed, which is the factor that must at all times be considered by the designer, the friction and gas speeds must be the same. All of which goes to show that

it is a false statement to say that the long stroke motor is more economical or even the least bit more powerful.

Then there are arguments against the long stroke motor as compared to the engine where bore and stroke are equal, the most serious of which is the extra weight that it must possess, and for which some of its own power must be used to propel extra tires bought to support the extra load, together with putting an extra strain on the driving gears, for if the motor runs only half as fast then the car must be geared twice as high to make the same speed and it is for this last reason that the makers dare not jump to the motor with twice the stroke, but make the stroke just a little longer than the bore. Then again I think that we all agree that the greater number of explosions or impulses per mile of travel the less these shocks are felt by the occupants of the car and the smoother the car seems to run, so why should we cut the number down by lengthening the stroke? There are several minor arguments that might be mentioned but as the above are the most serious and also sufficient I see no use to continue the subject.

The best formula that I have ever used to figure the horse power of a motor is somewhat complicated, but as it comes within 5 per cent. of the actual power that a motor will produce, wherever I have had a chance to compare the figures with the actual tested horse power, I submit it for what it may be worth.

Find the area of the piston and multiply by 35. (This assumes 70 lbs. average working pressure, but as a four-cycle engine only gets an impulse every other stroke, we use one-half the amount and then figure as though the power was applied every stroke.) Multiply this product by the stroke in inches and then by 5-6 to allow for the opening of the exhaust valve, then by the number of cylinders and then by the number of revolutions at which the piston speed will be 1000 ft. per minute, then divide by twelve to reduce to foot pounds and then divide by 33,000 to get the horse power.

For a two-cycle engine add one third.

The above figures for 70 lbs. compression, add five per cent. for every ten pounds increase in the compression or deduct 5 per cent for every 10 lbs. decrease. If the area of the exhaust port be less than one-sixth of the area of the piston deduct 5 per cent. If valves are in the head add 5 per cent. If crankshaft be offset between one-eighth and three-sixteenths of an inch per inch of stroke add 2 per cent. but if less or greater offset be used give no credit.

Clutch.

On this subject I think we can all agree that with the exception of where cheapness is necessary, when of course the old style cheap and easy constructed cone clutch is used and its use justified, that the only clutch for general service is that of the multiple disc form, any of which are good but I think that best of all is the three plate or disc constructed as part of the flywheel and which is so built as to require no oil, because I have seen three of these clutches in three different cars give upwards of 100,000 miles without even an adjustment, never being oiled and often slipping half the load for a considerable length of time.

Transmission.

This should be of the three speed (four speed if you prefer) sliding gear, selective, mounted on annular ball bearings. It is preferably mounted on the frame, thus taking the load off the rear axle where there

are no springs between it and the tires, and makes for lighter construction and shorter rods.

Those who have operated the planetary transmissions will agree with the statement that it is almost impossible to keep the bands free from the drums and at the same time have them sufficiently close that they will operate easily and positively, also that it is difficult to keep the high or direct drive clutch from either slipping or grabbing and at the best it is only with difficulty that any portion of the load can be slipped. Then the gears are working and wearing themselves out when engine is running idle and the reverse gears are working when in low speed forward and the forward gears when reverse is working, all of which tends to produce the noisy condition of this form of transmission.

The progressive form of sliding gear is in many respects equal to the selective form, but as it is necessary to pass through all the other speeds in order to get from high to reverse or to get from reverse to high it is not as convenient, and when a quick reverse might save the car and even lives, why should we use it when it has not a single advantage to offset its faults. In other words why should we become supporters of cheaper and more convenient construction?

There are plenty of small points of superiority that might be mentioned such as the mounting of the reverse pinion or idler on annular ball bearings, the placing of an annular ball bearing where the propeller shaft is divided instead of running this on a plain sleeve, causing the jack shaft to remain idle while driving in high gear, and other features of still less importance.

We might also take up the different qualities of steel, methods of making the gears fast to the shaft, methods of constructing the members that cause the gears to slide, methods of engaging the direct drive, etc., but as some of these points would require more than a mere outward examination and as all good features could not be found in a single construction the discussion of them would only be confusing.

Universal Joints.

These are an important part and a poor construction will give a great deal of serious trouble, but without naming the different makes, it is almost impossible to give anything like intelligent information, and as this part is one that is never injured except by wear the maker should be compelled to guarantee it for the life of the car, otherwise they acknowledge this to be a weak part of their construction.

Body.

This is simply a matter of personal preference, as it is impossible to state which is best, and the matter of design is simply whether you think it is nice or not. The only thing to look to after you have become satisfied with the material and design is to see that it is finished perfectly smooth and is in every respect a first-class carriage job, because the best of finishes go bad soon enough while a poor finish will look like an old car in a very short length of time.

The leather with which it is upholstered should not have an enamel, paint or varnished finish, for any of these will crack, wear off and look bad in a few weeks. Be sure it is either hand buffed or at least machine buffed on the natural leather that has simply been dyed to the desired color. It is well to have a guarantee that curled hair and not some sea-weed, tow, excelsior or other substitute has been used for padding.

Equipment.

Every car should have a glass front, top, speedometer, prest-o-light tank, and a complete kit of tools, (not toys) also five lamps. Whether these are to be kerosene or electricity is a matter of choice, but I have seen more people go back to kerosene oil after having the electric lights fitted, than those who retained the electric after they found out the amount of trouble they could furnish.

When it comes to tops there is the real cheap top with uncovered bows with no lining except that furnished by the inside of the top material, with the bows all showing and only wrapped with some of the top material with a few straps of the same material to hold it in shape, and then there is the real good top where the bows are covered with patent leather up as far as where they join the top, and then the top has a separate lining of broadcloth and no bows are visible on the inside, and then this good top is supported from back to front with extension arms of metal and is self supporting without the use of front straps, but these are also sometimes added for still further support. Then again the real cheap top depends on the back curtain to attach it to the rear of the body instead of using a metal fixture on both top and back of body with a good strong strap between them to hold the back of the top in place.

In General.

It will be noted that I have considered the gasoline car only and while a car built along the lines mentioned would of a necessity be of rather high price, it is not to be inferred that those of cheaper construction have no place on the market, for it is fully appreciated that there is a demand for low-priced cars, and if the makers would use plain bearings in the wheels, transmissions, engine parts, etc., and then put a good roller bearing in the rear axle construction and give a good set of universal joints and use a bevel gear differential and give a little larger tires, instead of trying to make the public believe that they were giving something for nothing by using cup and cone ball bearings and try to have you believe that they were annular ball bearings by simply saying that such and such places were equipped with ball bearings, without saying which kind were used, and then using cheap other parts to offset the difference in cost that these troublesome cup and cone ball bearings has created, they would fill the place in the market for which such a car is in demand, but so long as they try to make a cheap car in imitation of the expensive car just so long will the cheap car be the most expensive in the long run, due to the repair and maintainence being excessive.

It will also be noted that I have not taken up either the air-cooled or the two-cycle engines. The reasons are that I do not believe there is such a thing as an air-cooled motor, for in my way of thinking they are either air-cooled or not cooled at all. Of course I know that all motors are air-cooled, the only difference being that one attempts to cool by direct radiation, for which the cylinder wall does not furnish sufficient area, while the other fellow uses water as a means of carrying off the heat to a separate radiator which can and usually is made large enough to give the air sufficient surface to properly cool this water before sending it back to again become heated.

My objection to the two-cycle motor is that I have yet to see one that has anything like the control of a four cycle, more especially when running idle or on a down grade, and being of a somewhat mechanical

strain of mind this skipping and fluttering of the motor gets on my nerves, but for those that this feature would not have any horrors there is the simplicity of this style of motor that must appeal to them.

I have tried to be broad-minded in all my views, but experience has shown me many defects of the automobile and as I have tried to act as the adviser of the buyer and at the same time uphold honest construction, it has caused me to say some things that may be misconstrued as knocking, but in this respect I have tried to do no more than I felt that I was compelled to, and as all I have said is simply my personal opinion, which no one is bound to accept, I feel that even if I have misjudged the situation which of course in so broad an expression is possible, that others will take up the matter in question and point out their experience and show where they think I am wrong, which action on their part instead of hurting my feelings would be considered as a favor, for it is the farthest from my object that I might mislead anyone who might not have had as much experience in the game as myself.

Waste of Power in Mufflers.

In their efforts to obtain a quiet exhaust, some manufacturers employ a form of muffler which necessitates the passage of the exhaust gases through a number of small holes. A considerable loss of power may be experienced owing to these small holes becoming choked by the burnt oil and other residues from the engine. The remedy for this loss of power is, of course, to take the muffler to pieces and clean the holes, but, although the directions to obtain the desired end are very concise and occupy very few words, the time occupied in taking a muffler to pieces, cleaning and refitting it, often amounts to hours; this is in consequence of the threads of the various screws and bolts holding the portions together having become burnt or rusted. Having experienced the necessity to clean these holes two or three times in the course of six months, a driver determined to enlarge them permanently by reaming them out, so that the necessity for cleaning the holes would not arise so often. He fully expected that the exhaust would be considerably more noisy, but at any rate, so far as the occupants of the car are concerned, no difference has been noticed, although a distinct improvement in the engine power has been apparent. It would appear that the mufflers of some engines waste too much power to obtain a silent exhaust.

Saving By Auto Delivery.

Taking figures computed for a period of six months, beginning in August and ending in February, a large Brooklyn department store has shown by comparison that it saved \$1,360 through motor truck delivery as against the old system of similar service by horse wagons. The company operated eleven trucks during this period, one of them of the three-ton variety, and the remaining ten of one-ton carriage.

Where to Sell Cars.

That agriculturists will be the largest buyers of motor cars in the next five years is the firm belief of a prominent Western manufacturer, who says that the demand in the territory bounded on the east by Lake Michigan and stretching from the Canadian border on the north to the Missouri River on the south, will be greater than in any other corresponding area in this country.

Automobile Dealer and Repairer

A Magazine of condensed and compact information for busy readers.

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ADVERTISING RATES MADE KNOWN ON APPLICATION

NEW YORK, APRIL, 1911.

Missing Numbers—Our readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

PRESERVING AND REPRINTING.

Our readers are asked to preserve and bind the issues of this magazine whenever it be convenient. This will often save trouble both for them and ourselves.

Inquiries by mail are frequently made for information that has been published in detail in previous issues. Yet it is not often desirable to reprint such articles, nor is it feasible to print a synopsis in the Trouble Department, or to send such a synopsis by mail, although it will be our pleasure to do this in the case of new readers or others when absolutely necessary, for we owe them too much to be indifferent to their requests.

But if we reprint articles our old readers will have cause for complaint, although there is of course no objection when old subjects are treated in a new way or additional information given concerning them. In fact, the last word has not yet been spoken in the case of anything pertaining to the automobile.

But the filing of the magazine for future reference will be found useful and save us some embarrassment when readers send in for specific information—not in relation to some trouble of their car, for such requests are always complied with cheerfully, but for instruction regarding some construction or reconstruction that requires a good deal of space to properly cover.

As will have been noted, the full table of contents is now printed on the page facing the inside of the back cover, making reference comparatively easy.

AUTOMOBILE INSURANCE.

A reader asks us to tell him something about automobile insurance, to which we are unable to make reply even though he sends a stamp for the purpose. In the first place, we cannot decipher his signature

although we have had more or less of such work for, lo, these many years. Moreover, he does not mention the name of the State in which he resides and as there are several towns in the country by the name of Somerville, we are unable to locate him.

But this is not all. He evidently spent about 45 seconds writing his note, although it covered both sides of the sheet. As near as we can make out, however, he wants to know something about the new insurance rates that went into effect last fall, and with this in view, and the possibility that the information may be useful to others, we may say that the new rates are a reduction on the high-priced cars, but for small amounts of insurance and for second hand cars the rates are increased.

By the former rules a man carrying only a small amount of insurance on his car and paying a small premium, was as thoroughly protected from partial losses as a man carrying insurance to the full value.

The deterioration of second hand cars has been studied carefully, and for the first time the insurance agents have a definite schedule upon which to write their policies. It is expressly stipulated that upon 1910 and 1911 model cars costing from \$3,500 upward the insurance cannot be less than 50 per cent. of the list price. If insured for the minimum the rate is \$2.75 per thousand, the maximum \$2.25 per thousand. Cars costing from \$1,500 to \$3,499 of 1910 and 1911 models cannot be insured for less than 50 per cent. of the original price, 1909 models cannot be insured for more than 80 per cent., 1908 models cannot be insured for more than 60 per cent.

On cars costing up to \$1,499, the same requirement as to the minimum insurance holds good on 1910 and 1911 models. On 1909 models the maximum is 70 per cent., on the 1908 models 50 per cent. On all private pleasure cars that are insured with private garage warranty, there is a reduction of one-quarter from the schedule rate. For electric automobiles the rate is decreased from 2.5 to two, with a reduction of one-quarter on the whole for private garage warranty.

On steam automobiles the rate has been jumped from 2.5 per thousand to not less than three per thousand. On older models the rate must not be less than 3.5 per thousand. The amounts allowed are at the option of the underwriter. There is a reduction on machines having the boiler in front of the dash.

Insurance on automobiles used for livery and renting is written under the new schedule at one-half additional over regular rates. The charges for insurance to dealers is the same as the basis rates on new cars, but on second hand cars dealers must pay one per thousand additional.

THE INITIAL SHOCK.

Anything that is to take the place of the pneumatic tire should have a flexible surface where it comes in contact with the surface of the road or street. Quite likely something may soon be invented that may be as light and simple as the pneumatic tire, and at the same time be as comfortable for the occupant of the car, but a hard surface on the tire, the shock being obliterated at some point between the tire surface and the occupant of the car, will not answer the full purpose. Shocks upon any part of the chassis may not be so objectionable as if they extend to the body, but they are an objection, nevertheless, and serve to retard the car and strain the machinery.

In other words, what is needed to displace the pneumatic tire is a tire that is soft at its outside surface

or periphery; something that will strike a pebble or other obstruction and simply cause an indentation in the tire which will immediately resume its normal shape.

On another page of this issue will be found an illustration of a patent tire which is thought well of in England. It comes well endorsed, and seems to be practical and durable. But it will be noted that the outside layer of the tire is hard, the next layer is tough and somewhat flexible, the next is soft rubber, while the inside consists of a flexible tube. But if shock of the wheel is to be overcome, the conditions should be reversed, the air tube being at the outside, the soft rubber next and the hard rubber for the interior. This we say, should be the arrangement to secure the least shock to the wheel and consequently to the car, and likewise the greatest ease of propulsion. But when it comes to the durability of the tire, of course, the first named construction is far better.

A POTENTIAL GLIMPSE.

The time is coming when everything about the construction of an automobile save the assembling of parts will be done by machinery. Indeed, most of them are made pretty much that way now. Nor is such construction inferior, on the whole, to hand construction. By hand work any defect in material may easier be detected, but absolute precision may be more easily attained by machine.

Whether the entire construction of the car by machinery is to result in much reduction in prices, is doubtful. Prices are at present based upon more or less machine construction. Yet with special machines for fabricating and finishing the parts, and with the usual constantly increasing speed of such machinery, the low cost of construction will finally be rather amazing to those not familiar with modern methods.

Up to the present time, however, prices of automobiles have not been exorbitant in proportion to their cost and the expense of selling. Competition has been so healthful that purchasers have not suffered, but it has not been so unscrupulous and fierce that worthy firms have been forced to the wall.

The future is somewhat uncertain, however, both as to price and to trend. The "big fish may swallow the little ones," but if this be the case, it will not be analogous to the carriage making industry, which has never been dominated by combinations or large organizations.

LONG AND SHORT STROKE.

The views of some of the automobile manufacturers concerning the long and short motor stroke as expressed on another page will be read with interest. As will be seen, the subject is one which cannot be properly discussed without taking into consideration a good many correlative facts.

In this connection, it may be remarked that we have in hand an exhaustive article upon the subject by Mr. C. J. Pembroke which was unavoidably omitted from this issue. As has been noted by reading Mr. Pembroke's articles, he always fortifies assertions by a strong foundation of facts and reasons.

IT MAKES A DIFFERENCE.

Here's a suggestion: Reward those who drive slow; they improve the roads. Fine those who drive fast; they ruin the roads. It may seem rather hard, but it is justice and blind justice, at that.

Let us be just and fair, though the heavens fall.

Rapid driving has played havoc with the roads around this city. It is true that Chicago claims to have the worst streets and roads of any city in the world, and possibly this may be based upon a better foundation than other comparisons that are wafted abroad by Lake Michigan zephyrs, but New York is a close second.

The automobile bears about the same relation to the roads that drugs do to the stomach. It all depends upon how they are used.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

It is the intention to print the circumstances of only a few of the more unusual accidents that may serve as a lesson to automobile drivers. All drivers should be able to avoid the more common dangers.

From expressions of prominent automobile men, it would appear that speed mania, one of the negative features of the autos' greatest success, is passing.

George McClure Sargent, secretary of the Safe Roads Automobile Association, says: "There are, of course, some who have always driven, not only too fast, but also in such a way as to endanger the safety of others; and they always will until their licenses are withheld by the authorities; and every effort should be made to assist the authorities in accomplishing this. But probably 95 per cent. of those who now operate try to drive with due regard for the safety of other users of the highways, and in such a way as to prevent this comparatively new mode of travel from being a nuisance to drivers of horse drawn vehicles and to pedestrians and dwellers near the highways."

Overspeeding in automobiles in a short time will be looked upon as low and vicious, but it is to be hoped that the 99 cautious and safe automobile drivers will not be confounded with the one reckless driver.

Today the purchaser very seldom inquires how fast the car will travel, knowing that any reputable make of car will travel at a much higher rate of speed than is practicable for him to drive. His anxiety is to know what the hill climbing qualities are, and what the reliability of the car will be on long tours.

A. A. A. automobile clubs all over the country, now numbering something over 400, are working as a unit to weed out reckless drivers, whether they be chauffeurs or owners, and the insane desire for speed is rapidly being done away with.

Taking a Sharp Turn.—Four men in a big five thousand dollar Lozier car attempted to take a sharp turn in the road near New Brunswick, New Jersey. It was at a down grade and they were going at high speed. The car ran into a ditch at the side of the road and overturned. All the occupants were thrown out and seriously injured. There were broken legs, cuts and possibly fractured skulls. It will be a long time before the victims are out again, and the car is pretty well demolished.

A Lesson in Driving.—Near Marion, Indiana, a man was teaching another how to operate a new five passenger car, there being three children passengers. He lost control of the machine and the car turned over on the side of the road. All five passengers were caught under the car and one of the men was fatally injured. It is believed that the other, although badly hurt, will survive.

Mobbed by Unreasoning Foreigners.—A five year

old lad was run over in Perth Amboy, New Jersey, and instantly killed. The car was going at a moderate rate and it is stated that the child stepped directly in front of the machine and was knocked down and run over. A large crowd collected and the sight of the dead body created a frenzy of indignation. The howling mob cut the back tires of the car into shreds, smashed the lamp and tore off the license number. The chauffeur was glad to escape with his life, but he was afterwards exonerated by the coroner.

Ran Into a Gate.—Mistaking a signal at a railroad crossing near Youngstown, Ohio, a man drove his automobile to the tracks and came into collision with the gate. It was torn loose but the car managed to just clear the tracks when the train pulled by. The car driver saw the man swinging the lantern and thought it was a signal to go ahead. His car was pretty well demolished but the occupants were not seriously injured.

Plunged From a High Bank.—Three men were riding near San Rafael, California, at night when the front tire exploded. The car swerved and in spite of the frantic efforts of the driver to bring it back into the road, it went over a steep bank into a ravine below. One of the men received internal injuries, but he may recover. The others were likewise seriously hurt and the car was wrecked.

Defective Steering.—Near Owenton, Kentucky, the driver of a big automobile truck turned at the point of the road to let a buggy pass. In some way his steering gear failed to act and the heavy machine went through the fence and over a cliff. The car was going slowly and the driver jumped and saved his life. The machine was left bottom side upward against some trees, down in the ravine.

Hit by a Train.—A passenger train struck an automobile at the railroad crossing near Cincinnati and was thrown a distance of thirty feet. The sole occupant of the car is not expected to live and the car itself was totally wrecked. It appears that the approach to the crossing is around a sharp curve and the driver did not hear the approaching train.

Two Children Killed.—Two small children were killed by automobiles near Chester, New York, and although it is stated that the driver was not to blame, friends of the victims' parents threatened to mob him and he was rescued by the police. The crowd slashed the tires and scraped the paint from the car in their rage.

Varnish for Brass Work.

To lacquer brass work on a car, first rub the metal with a weak solution of vinegar and salt water till every bit of foreign matter is removed. Next wash with warm water and soap and polish with a dry cloth. Now put on your lacquer and it will stick. Most lacquers slightly darken the color of the brass, and some of them do not last long enough to pay for the trouble of putting them on. There are others, however, that will last for a whole season.

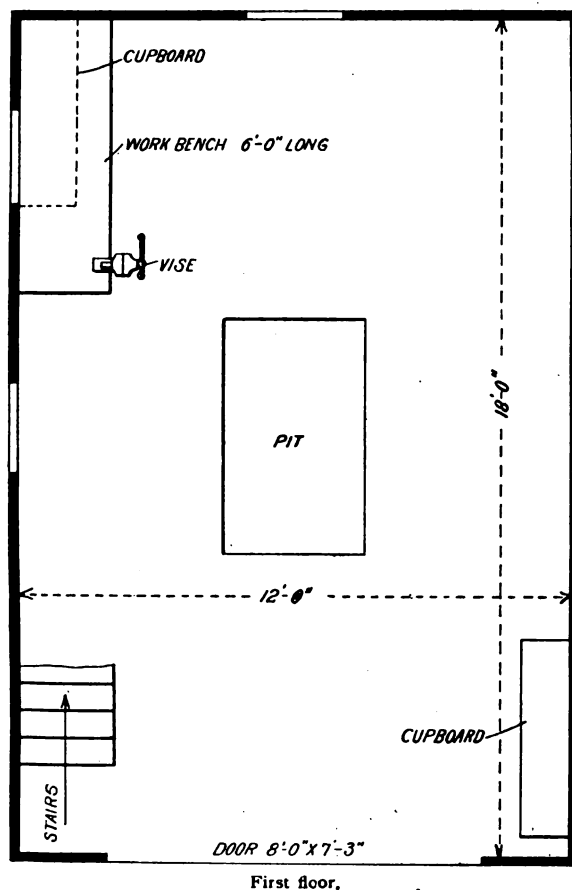
The Cleaning of the Muffler.

Attention to the cleaning of the muffler must not be lost sight of, for this is a point having a great effect upon efficiency. For open cars the writer considers a cut-out a necessity; not for roaring through towns or villages, but for the purpose of testing the firing and carburation.

A Garage for Less Than \$100.

From E. L. Dillon, New York.—I am enclosing you a picture and description of my private garage, of how it is built, and what of. I built this building myself and did not pay out anything for work on it. The size of the garage is 12 x 18 feet by 12 feet high. I dug a trench 2 feet deep and filled it with stone and made a cement wall 8 inches thick and 1 foot high and then put on the sills, and then put studding around, 2 feet apart and then put in four windows about 2 feet above the sill. Then I covered it over with painted sheet steel 2 x 6 feet, that is made to represent brick work and covered the roof with two ply Congo roofing. My ground floor is flagstone and the upper floor is matched boards which makes it very near a fireproof garage.

I have a pit in the center of the stone floor so I can get under my machine, also for the water to run off when I wash it. I have a work bench 6 feet long with a vise on it. On side of the garage and over the bench I have large cupboard for my extra shoes,



inner tubes, patches, cement and other extras. Under the bench I have eight drawers for small tools. The stairs to the upper floor are in the corner behind the door and fixed so I can swing up out of the way when not in use. On the upper floor I have a cistern that holds 40 barrels which fills from the roof of the garage when it rains. I have a hose connected to the cistern with a faucet on so I can wash my machine or fill the radiator. Also my gasoline tank is upstairs, and a lead pipe with faucet on runs down by the side of the wall and I slip on a rubber hose and fill my gas tank or machine direct from the above. I also keep my machine oil and heavy grease upstairs. I have a common cistern pump that pumps my gasoline direct from the barrel on the ground to the tank in the upper floor. My door for the machine to enter

the garage is 8 feet wide and 7¼ feet high. I have an upper door also 4 x 4 feet., so I can put up tackle blocks and can hoist up anything I want to.

Now this is a country farm garage where we do not have city water and other improvements, but have to depend on rain for it. This garage is two story. Of

4 windows	3.20
3 pair hinges and door latch.....	.40
Flagstone for floor	1.00
3 bags of cement for walls.....	1.50
Sand for walls .....	.50

\$65.49

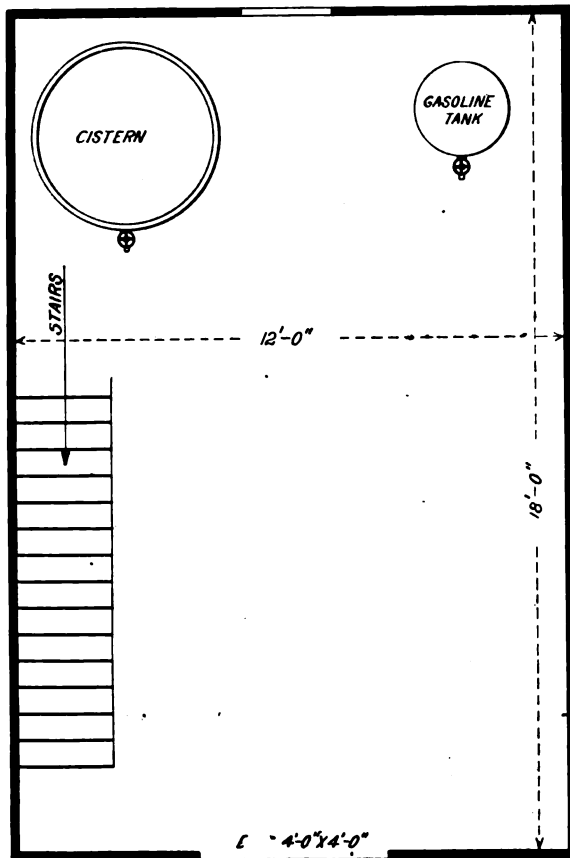
I have not put in any cost for inside finishing, as different people would finish it in different ways.

Descending Hills.

In descending hills, both judgment and experience are necessary. If the grade is gentle and the road straight, free from traffic, and without side roads, a fast pace may be maintained. Under no circumstances, however, should a steep hill be descended fast if there are blind turns or if there is much traffic. On dangerously steep down-grades it is essential to safety to begin the descent slowly. At a fast speed the momentum is enormous, and once the car has got out of control, brakes cannot be relied upon to hold it. Most of the serious accidents recorded have been due to drivers tackling a dangerous hill at too fast a pace and losing control. If the driver, through want of caution, finds himself traveling too fast on a dangerous descent, he should act promptly but with discretion. To jam the brakes on to their fullest may only cause one or both to collapse. Taking it for granted that he is running against compression (with the ignition switched off) he should apply both brakes with gradually increasing pressure until the speed is checked, and should descend the rest of the hill at a slow speed, relying upon compression and one of the brakes, using these alternately, so that they will not overheat, and keeping the other in reserve. If one brake is connected to the clutch, of course he can only use the other in combination with the engine. At a high speed the engine compression loses a large proportion of its effectiveness, and it may then become necessary for him to apply the second brake, thus declutching. The operation should be done quickly, but with judgment. On a long hill, which is steep, but not necessarily dangerous, it is very unwise to descend at a high speed with the brakes on. The heat generated under such circumstances is enormous, and the brakes at any moment may become ineffective, or even collapse, when, with the high momentum obtained, it would be impossible to stop the car. On long, gentle hills it is advisable to switch off, as this gives the engine a chance of cooling. Very few throttles are absolutely gas-tight.

When surmounting an exceptionally steep incline, on, say, the low speed, it is well to keep in view the possibility of a shaft breaking or a chain coming off, when probably the only available brakes, namely those on the back wheels, might not prove strong enough if the car commenced to run backward. A good plan is to hug the right side of the road (if not a precipice) so that if such an accident occurred the car could be quickly backed into the curb, fence or gutter. If the road is wide, however, hug the most dangerous side, and then, in case of a stoppage from the above causes, swing right across the road backward. The car will probably come to a standstill before touching the curb or fence.

A bad feature of traveling at night is that in taking the turns it is really impossible to see what is just ahead. The light goes dancing off into the air, and it is not until the car is straightened out again that it is possible to tell what the road holds.

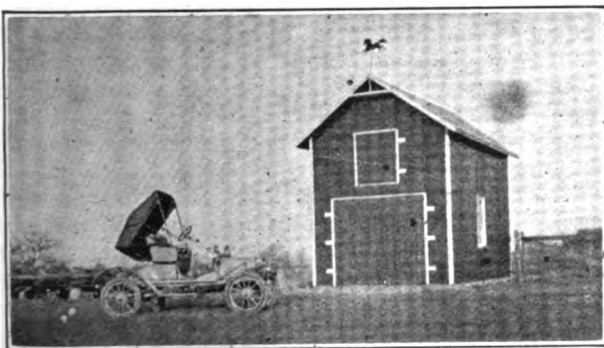


Second floor.

course it could be built cheaper if it were only one story. I enclose also a plan of my garage.

Material for Garage and Cost.

800 sq. ft. iron cover building.....	\$16.00
100 ft. matched pine for doors.....	3.90
4 rolls Congo Roofing	8.40
360 ft. roof boards	7.20



Mr. Dillon's garage.

500 ft. 2 x 4 x 12 ft. studding.....	11.00
4 ft. 6 x 6 x 12 ft. for sills.....	3.24
1 ft. 6 x 6 x 4 ft. for short sill in front.....	.27
8 ft. 2 x 6 x 12 ft. upper floor joists.....	2.16
260 ft. matched pine boards for upper floor.....	5.72
Nails	1.00



This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Inquirers will please write plainly and give full particulars of their trouble, stated as clearly as possible.

515 Troubles "and Then Some."

From B. W. Schickling, South Dakota.—I have more or less trouble with my Model T Ford car. I have experienced all the troubles so far related by Ford owners and more. 1st—What is the cause of the exhaust pipe heating red hot at times just above the carburetor and under the gasoline tank all along to where the opening is toward the back? 2d—What causes a humming noise or buzz that appears to come from the differential, or somewhere under the car? I am certain it is in the working parts and is a new trouble, as I haven't noticed it until a week ago. Is it safe to make long trips in that condition? 3d—My car seems to consume an awful lot of cylinder oil. To keep it at the bottom pet cock level I have to put in about a quart every 25 miles. Should it use up that amount? 4th—Will a slight knocking in the cylinders do any harm? I had the engine off and tightened all the burrs, etc., but the knock is still there even when all four cylinders work fine and even. Kindly give me your advice?

Reply.—The cause of your exhaust heating to the extent you mention is due to either a very late ignition or a very rich mixture or both. Either or both of these will allow the burning gases to escape into the exhaust pipe while still burning briskly and so the flame will follow the entire length of the pipe, causing it to heat to a dangerous degree. The humming noise you mention is no doubt due to the worn condition of the drive shaft thrust bearings and should be attended to at once. I would not attempt any trips until this has been seen to. You must have a bad leak somewhere, in either your crank case or transmission case as it is impossible for this motor to consume the amount of oil you mention. When a knock is heard in any piece of machinery it is always a sign that it should receive immediate attention. As we have no data to indicate what causes the knock therefore have no means of knowing what damage it may do.

516 Wants to Know Much.

From C. Avery, Indiana.—I would be pleased to have you answer the following queries in your journal: Explain fully the meaning of 6-60 or 6-80 as used by dealers to designate different automobile storage batteries. What kind of electric lamps are best adapted to automobile use, and how many candle power would headlights have to be, to equal the strongest gas lights generally used? What candle power is best for side and rear lamps? What storage battery would be ample to supply plenty of electricity for the five lights? Could such a battery also be used at the same time for ignition? If so, is any special wiring or device of any kind needed to alter the current before reaching the coil or spark plugs? Explain any such device needed. Can the Delco Coil outfit be used with such a strong battery? Are there any small generators made for automobile use, which would

keep such battery charged, and automatically stop the generating current when the battery is fully charged? All things considered, which is the most preferable way of driving such a generator, by belt, roller chain or by cog gears? What is the worst drawback in the use of each of these methods?

Are any timers made to fit the crank shaft of two-cycle motors so as to dispense with the half-time shaft? If not is there any reason why they could not be made to use in this way and thus simplify the motor, if so explain why? How much more deterioration, if any, will occur in gasoline stored in above ground tank protected from the sun, over same when stored in good underground tank.

Reply.—6-60 or 6-80 means 6 volt 60 ampere or 6 volt 80 ampere. Tungsten lamps are best, as they consume less current. Sixteen candle power lamps are generally used and are found large enough. Six candle power lamps for side and tail lights. A 6-100 battery is most satisfactory. It could also be used for ignition purposes but it is not advisable to mix the two. No special device is needed, as the voltage is the same for both. The coil mentioned can be used with this battery. We have yet to hear of an outfit such as you mention for charging that is entirely dependable. Gear driving is most satisfactory. The advantages and disadvantages are too many to allow of discussion here. Write the Elmore Company for information on devices for two-cycle motors. We cannot give you figures on the difference of underground and exposed tanks but common sense tells us that if both tanks are air tight the results must be the same. By air tight we mean metal tanks with all openings securely closed; wood tanks or barrels cannot be termed air tight as gasoline will evaporate through the wood.

517 A Magneto Trouble.

From C. W. B., Ohio.—My four-cylinder car, equipped with Remy magneto, is giving me fine satisfaction and I really have no trouble worth speaking of, but it occasionally manifests a peculiarity that I do not quite understand and should like to have explained. Under all ordinary circumstances it fires with great regularity and delivers good power. On a particularly steep and difficult hill, however, about all that it is able to take on high gear, even when still making ten or twelve miles per hour, it will begin to miss explosions, making it necessary, of course, to change to low gear. What is the cause of this and the remedy?

Reply.—The missing may be caused by trying to run the magneto at so slow a speed that it will not generate sufficient current for the proper ignition, or the porcelains in the spark plugs may be cracked or the points of the plugs are too close together. Try this car on a hill and when the missing begins, throw the coil switch over to the battery side and if the missing stops you may be pretty sure that the magneto is not running fast enough to generate the current required; but if the miss continues, look for cracks in the spark plug porcelains. Many times these cracks are so small that they look like mere scratches. These small cracks do not seem to affect the motor in ordinary work but will allow the current to leak when the motor is put to a hard test. This magneto is peculiar in its action when required to run at very low speed in that the gap on the spark plugs must be much greater than is used with any other magneto. I have found many times that no results could be obtained with these points less than 3-64 inch apart at which

setting the motor could be throttled to five miles per hour and work perfectly.

518 **Fault of the Piston Rings.**

From J. C. Sonner, Illinois.—I am using a 1910 model Buick car in which the second cylinder (from front) has been causing me trouble ever since I began to run the car. The motor skips at times, especially when running slow, and the trouble seems to be in one cylinder, for it will fill up with oil, and soot and grease the spark plugs until they will not fire. After cleaning the plug it will run all right for seven or eight miles until the plug gets dirty again. The plugs in the other cylinders have never caused me any trouble and I never have cause to clean them or bother with them. I have changed the spark plugs, put in new rings, had the valves examined and ground, had some garage men fix it, and written to the Buick Company, but nothing has eliminated my troubles so far. Any suggestions you might offer will be greatly appreciated.

Reply.—This trouble is caused by the piston rings not fitting perfectly in the cylinders and may be overcome by grinding the rings to a fit in the cylinders with oil and ground glass. But as this is a long tiresome undertaking and not always a permanent remedy, we would suggest that you remove the four pistons and ship them to the factory at Flint, Mich., with a request that they cut oil grooves in them the same as are on the 1911 pistons. This will not be an expensive operation and will insure you a permanent cure.

519 **Wants Higher Gear.**

From C. F. Freer, New York.—I have a Flanders 20 h.p. car. The gear ratio is four to one. I would like to increase the power about 20 per cent. If the gear were changed that much would the power be increased the same, and could the change be made? How would it affect the engine? Would it run as smooth? Would it be more likely to overheat, and would the wear be more? In my section there are a good many hills. The car will run 40 miles an hour on a good road. I do not care to go over 30 or 32 miles. I thank you in advance for any information you may give me.

Reply.—We would hesitate to advise such a change without first consulting the manufacturers of this car, as to their opinion of the motor standing up and giving satisfactory results under the increased speed at which it would have to run should such change as you mentioned be made. Ordinarily this reducing of the gearing would tend to shorten the life of your motor as the greater speed would naturally cause it to heat more and wear more rapidly. Manufacturers of automobiles take in consideration all road conditions and gear their cars as they consider to the best advantage of owner and manufacturer.

520 **Setting the Air Valve.**

From E. A. H., Iowa.—This may be a foolish question but I am just foolish enough to ask it. In what position should the throttle disk or gate be to commence with to adjust the needle valve? And also the tension spring on the air valve—should it be weak or strong? I have a ten h.p. two-cylinder Maxwell, with model D carburetor. Last summer while the weather was warmer, I had it so it had both power and speed, but after freezing weather I could get neither. I got the best results by relieving the tension spring all I could and opening the needle valve

to three-quarter turn. And which gives most power or speed, when the fuel level is low and the tension strong, or when the fuel level is high and the tension weak. I hope some one will give me a pointer on this.

Reply.—Set the air valve so that the spring tension is just strong enough to hold the valve closed, then adjust the gasoline. This will give you the best possible setting provided the gasoline level in the float chamber is 1-16 inch below the opening in the nozzle.

521 **An Elusive Cylinder Pound.**

From a Subscriber, New York.—I have a two-cylinder model A Rio touring car and am having some trouble with the rear cylinder. This cylinder, complete with piston, pin and connecting rod, was put in two years ago and ever since there has been a pound in it. I have tried everything I knew but still the pound remained. All bearings are O. K., cylinders and pistons are free from carbon, valves re-ground, and the timing both of valves and spark is O. K. The piston pin fits in piston all right. The compression in the rear cylinder is very good, much better than the front cylinder. The gas inlet pipe is in good condition. When I run the machine on a level road the pound is not so noticeable, but when I go to climbing hills it pounds badly. Also, when I set the brake and slide in the clutch the pound then takes on the same appearance as when I climb hills, that is, a rather sharp and pronounced knock. The most peculiar thing about it is that it has pounded ever since this cylinder was installed, and the repairman who put it in could not locate the trouble.

This knock is a very disagreeable one and I would be very much obliged if you can help me.

Reply.—As your repair man has no doubt gone over all ordinary causes of this pound there is still one that is not often looked for where new parts are used as in your case but there is where it is most likely to occur, namely, a piston that is too small, which will give a bad knock as it slaps from side to side in the cylinder. Have this cylinder removed and measure both the piston and cylinder and if the piston is over one one-hundredth inch smaller than the cylinder look out for a knock from that cause.

522 **Removing Cadillac Sprockets.**

From John P. Hood, Michigan.—Will you kindly describe in the magazine the operation of removing and replacing the sprockets of a model M Cadillac, 1907 or 1908?

Reply.—The operation necessary to remove the rear sprocket, is first to remove the axle from the car. Separate in the center and remove the sprocket by either cutting off the rivets, or removing the screws which hold the same to the differential head. To remove the front sprocket, first remove your water pump, disassemble the transmission. After doing this you will see that the sprocket is held in place by several small rivets which pass through flanges on either side of the sprocket. As you are located so near the manufacturers of this car, we would suggest that you send to them for their parts list of this car which includes cuts which would materially assist you in many jobs of this nature.

523 **Defect in the Coil.**

From U. C. Boss, Wisconsin.—I have a car that has a double opposed motor. If I hold down one of the vibrators on the coil, only one cylinder fires, but if I press the other one both cylinders keep firing and there is considerable sparking across the timer. It

does not seem to affect the power of the motor and has been that way ever since I had the car, about three years. Still I should be glad to know the probable cause of it.

Reply.—The action you describe would indicate a poor ground connection of the high tension side of one coil which would allow the current to leak across to the other high tension wire and so ground itself through the other plug and by so doing fire both cylinders. The tracing of this action would require too much space and several diagrams to be attempted here, but you can probably accomplish it without such detailed information.

524 May Be Due to Imperfect Ignition.

From C. F. Moore, Nebraska.—I have a Model T car, bought last fall and have run it about 600 miles. I have trouble with the engine backfiring. Would a Master vibrator help this any? The head lights are wired to the magneto for lights. This affects the running of the engine also. Is there any way to prevent and remedy this trouble. Any information you can give will be appreciated.

Reply.—Imperfect ignition would cause the motor to overheat and backfire. We have only to refer you to letters in our columns from Model T owners who have installed the Master Vibrator and had very satisfactory results. In fact many Ford branches advise the change. There seems to be a difference of opinion as to the advisability of operating lights from the generator. The makers of the car advise not to do it but others claim to have done it with satisfactory results.

525 A Solitary Motor Kick.

From E. L. Hills, South Dakota.—I have a Maxwell A A 1910 Runabout for the past two weeks. On the first cranking of the engine I always get a "kick." This does not happen when the car is cool, or at least when the car has stood for several hours, and only one kick occurs. After that all goes right. What is likely to cause the trouble?

Reply.—From the described action of your motor I would think it caused by the ignition being a little too early, it being so little that it would not show when the motor is cold and the gasoline vaporizes slowly. But when the motor is warm the mixture will be much better and ignite quicker, so that a slight kick is noticed if the motor is cranked slowly. It would be well to have some experienced man look over your timing.

526 A Leaky Carburetor.

From P. C. B., Michigan.—Would like to have you give me a little advice on a leaky carburetor on my Brush car. It is a Kingston and has been run about 6,000 miles. It does not leak when the engine is running and does not affect its running. I have had a great many experts look at it. They said it should be cleaned and I did so, but it was no use. One chauffeur told me to dry the float and shellac it twice. I did it and now it leaks a small stream.

Reply.—A cork float, after having been used some time as yours seems to have been, will often absorb a quantity of gasoline, and this constantly increases its weight, this keeping the gasoline level in the float chamber above the level of the top of the vaporizing nozzle. This means a constant loss of gasoline when the car is idle. The remedy is to reduce the weight of the float until the gasoline is flush with the top of the vaporizing nozzle.

527 On Ignition Improving.

From H. K., Wisconsin.—I have a two-cylinder, 24 h.p. slow speed engine in my car (Northern) with dry cell ignition, six batteries working at a time. Would there be any way of improving the ignition system on this car? Under the circumstances it works well as it is, but other ignition systems have been suggested to me as far superior.

Reply.—The best advice we can give in this matter is that when a car is running nicely, as you say yours is, let it alone and don't experiment. Experiments are expensive and many times produce results far from those sought. If at any time your ignition fails to work as desired, we shall be glad to try to help you.

528 Magneto Ignition Most Dependable.

From Guy Bradley, Michigan.—I have an Olds car, four cylinders, Model S. It has a storage battery. Which would you advise me to buy, a magneto or a new storage battery, and if a magneto, what kind?

Reply.—Magneto ignition is much more dependable and usually gives better results. As to the magneto best to use, it is a hard matter to decide as there are so many on the market of about equal merits. Perhaps the Olds Motor Works could better advise you on this point from their experience with different makes on this model car.

529 Buick Lubrication.

From Robert Darling, Nebraska.—Has the Model F Buick ball or roller bearings in the rear wheels? Do the ball or roller bearings require grease by taking the wheel off, the same as the front ones, or does it get its grease from the oilers on the axle?

Reply.—The Model F Buick car has roller bearings on the outer end of the rear axles, which are lubricated from the grease cups just back of the spring seats.

530 Spark Plug Trouble.

From D. D. Hurlbert, Ohio.—I desire to answer a query of F. R. Marrs, of Dakota, who in a recent issue complained of spark plug trouble. I have been driving a Maxwell Q, and had a great deal of trouble similar to his, which was oil in the combustion chambers, and from there on to the plugs, causing misfiring. A friend of mine suggested that I try a Reflex spark plug, which, he said, would spark in oil. I put in one plug on or about June 1, 1910, and used it continually from then until about the middle of February of this year without any adjustment whatever, with positively no cleaning, and the plug never left the cap from June 1 until the middle of February. Shortly after putting in the first plug, I equipped the other three cylinders with the same plug and they have done perfect work ever since. If Mr. Marrs has not already remedied his trouble, I am sure that the Reflex spark plug will do his work right.

531 The Fire Flies.

From Subscriber, New York.—Can you tell me what is likely to be my difficulty in not being able to start my two cylinder engine? The last time it was running (for about an hour) I became alarmed at the masses of flame and sparks that shot from the exhaust pipe, and stopped the engine instantly by throwing off the switch, but when I felt the water jackets they seemed not to be overheated. The oil cups were not feeding very regularly, being of the

old type. The car is an early model of the Pope-Toledo make.

Reply.—Don't be alarmed at fire flying from any part of this car for it is likely to come from the most unexpected points. This is not a knock but I had the pleasure of being in charge of one of their repair shops from the time the first car was built until the last one was put out, and my experience with them is exhaustive. Your trouble is entirely due to carbon in the cylinders and either weak intake springs or stems that stick in the guides.

532 Can't Get Good Ignition.

From S. S. Hale, Missouri.—We have a Mitchell Roadster automobile which is equipped with a Splitdorf synchronized multi-cylinder coil with a Master vibrator. We are using dry batteries and it takes a set of six cells to run the car about twenty miles. The car was originally equipped with storage battery. Could it be possible that this coil is not suitable for dry battery and be responsible for using so many batteries?

Reply.—The coil you mention should give satisfaction on dry cells. See that all primary wires are well insulated from any metal parts of the car and that there is no chance of a leak from one wire to another; that the commutator is clean and the ground wire from the bottom of the coil farthest from the Master vibrator has good connection, at both the coil and the ground. After satisfying yourself that all these conditions are perfect, if you still are unable to get the proper mileage, you may be fairly sure the trouble lies in the coil, in which case it would be advisable to remove the coil and ship to the nearest Splitdorf branch for expert inspection and repairs. The Chicago Branch, 319 Michigan Ave., would be most convenient for you.

533 Trouble With His Metz Car.

From J. A. Schweitzer, Michigan.—I have a Metz air cooled car. I wish to have some information. 1—What class car is it? 2—What oil is best adapted for it (what brand)? 3—I have experienced that it fouls so quickly and my power is gone. I blame the oil I use. 4—How can I adjust the use of air and gasoline in the carburetor? I have trouble something like this: When run at a low throttle and want to have more power then I open the throttle little over half, my motor almost stops, but most always picks up again, only when at a bottom of grade I often have to stop, or change my speed gear, and get a new start. Now I am a new man at the business but it seems to me that the level in the carburetor is too low and too much fuel rushes in which is too rich and does not ignite. And do you recommend a better grade of gasoline? I am very much pleased with the Automobile Dealer and Repairer.

Reply.—The car you mention is a good one in its class. There are many good oils that will give satisfaction; in fact any medium heavy air cooled cylinder oil. To get good results it is necessary to confine yourself to a high-grade oil made for air cooled motors and not allow yourself to be led astray by any of the just-as-good oils at lower prices. Your carburetor is similar to the Schebler and should be adjusted the same. In your case try adjusting the air spring a little tighter and giving a little less gasoline at the needle valve. If no relief is obtained, remove the float chamber and lower the float 1-16 inch by bending the arm on which the cork float is supported. Then adjust the air valve spring so that the

valve seats very lightly, after which you will be able to get the desired results by adjusting the gasoline needle for more or less fuel as needed.

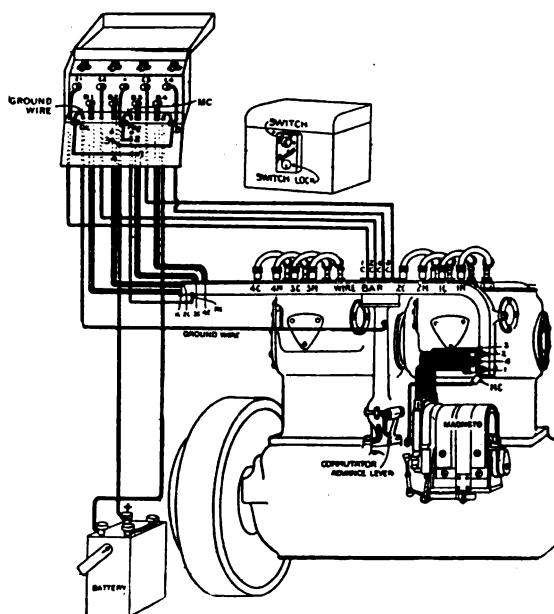
534 Magneto Trouble.

From R. E. Goodwin, South Carolina.—I want some one to tell me what is the matter with a Model T Ford touring car that works O.K. on batteries but won't work without popping and missing and reports in the exhaust that sound like firing a shot-gun when running on magneto.

Reply.—Your trouble is no doubt due mostly to the improper adjustment of the coil vibrators. If these vibrators are so adjusted that they vibrate slowly they are liable at certain speeds to synchronize with the generator waves and by so doing a very low tension secondary current is produced. Care must be exercised to adjust the vibrators all alike and as light as possible so that the vibration may be very rapid. Perhaps you might find more permanent relief by following the method adopted by many of our readers whose letters you will find in our columns of nearly every issue.

535 A Wiring Diagram.

From R. H. E., Connecticut.—Would you please answer in your next issue how to wire up and give a diagram if you can, how the 1911 Peerless switch



Wiring for the switch.

on their four-cylinder, 30 h.p. car is arranged. Also if you think the Skinner air pump is a reliable pump to put on a Peerless. Have an 1909 Model 19.

Reply.—You may trace from the diagram given the wiring of the switch, also any other parts of the wiring you may be in doubt about. The pump you mention is considered reliable and is used on many cars.

Trouble Notes.

From Wm. D. Troutner, Illinois.—There are many automobile engines which will stop when cut down on the low or slow speed as it is customary for auto drivers to throttle down the speed of their engines while the car is standing. The man who is operating the car wonders why it does this as it did not do so when the car was new. This part of the work he has never studied and therefore he is at sea to know the reason why, never taking into consideration that the engine has any valves.

He just supposes that it ought to do the same as when new and everything was tight. Well, when the driver gets ready to go he gives the engine a cranking and he gets into the car and she moves out and seems to be all right until he comes to his next place to stop. There he has the same trouble. He throttles the gasoline down and also retards his spark for a slow motion of the engine, throws the car out of gear and aims to let the engine run at a slow or low speed. But the same trouble is here again and the engine stops. The driver is a chauffeur or a licensed automobile driver and a dandy fellow, but what he don't know would make a big book. It has finally got to such a stage with him that he takes no chances, so when he wants to stop he stops the motor and when he wants to go he just gives her a winding up with the starting crank and climbs into the car and moves right out. All this time he has never tried to locate any trouble of the engine. Probably if he had he would have found only more trouble.

Now I will give the reasons why some automobile engines slow down on low speed and stop. This trouble never happens with a new car unless it has been tampered with and put out of adjustment. We all know that even the new machines give an endless amount of trouble sometimes, but not as a rule if they are left alone as they come from the factory. We will refer to a car which has been run for a year or so. If the car has had lots of work to do and has made lots of miles run there will be this trouble and this comes from the valves. There are not many automobile owners, chauffeurs or drivers who take into mind that the valves of an auto engine have lots of work to do. Of course there are some extra fine machinists and mechanics who run automobiles and these parties never have much trouble, as they know what a valve is in an engine for, where there are hundreds who don't know the difference between steel and iron. All auto engines are cast from a grade of gray or cast iron as is generally called. The valve is of nickel, Bessemer or special steel. These are forged under heavy drop hammer dies and the object of this process of forging is to make the metal solid, close grained, tough and hard. After this they are turned true to gauge and then case hardened or tempered and ground to size for the engine. If we could keep the valve hard all the time we would probably have less trouble, but after a long time of running the engine we begin to notice the power weakening and when the automobile stops and is thrown out of gear the engine slows down and stops. The wonder is what causes it. The cause is from the pounding of the valve on the valve seat, causing the valve seats to wear. The fire from the explosive gases in the upper end of the cylinder soon takes the temper or case hardness from the valve head. This leaves the valve head soft as the metal it was made of before it was hardened or tempered. Now we have a soft valve head and a cast iron seat for the valve to pound in while the lower end of the valve stem is still hard as glass. We can see, if we just think a minute, that the valve has hammered in its seat and has changed the time of opening and closing of the admission and exhaust. This gives the compression a chance to escape and causes the engine to slow down and finally stop running as the charge is not heavy enough to keep the speed up. Grinding valves is all right if the party understands the work but there are as many engines and valves spoiled as there are made good by grinding. In some engines grinding valves is of no use whatever to the engine and only helps to make them worse. The stem may be all worn in the stem guide and a shoulder on the stem may cause trouble when the engine is started. Grinding the valve would lengthen the stem and then the shoulder on its stem would strike and your trouble is only more

instead of less. The best advice is to have new valves and a mechanic who knows how to do this kind of work and keep car driver or chauffeur out of it if you want to have any pleasure out of the car. Some more faults come from the tension of the valve springs, they becoming weak from the heat of the engine. This causes the valves to seat themselves very light, and also the continuous heat from the engine firing from its exhaust valve causes it to warp in some make of engines. This is another fault, for the valve can't seat properly. It can be remedied only by a mechanic who knows how to do this kind of work, as it has to be done by a first-class workman.

Electric Lights on Ford Cars.

From C. D. Warner, New York.—I note your reply to 487, relating to operating electric lights from a Model T Ford car generator in which you state it is not advisable. I beg to differ with you, as hundreds are operating lights on these continuously. On our Ford taxicabs we have used nothing but electric lights operated direct from the magneto for nearly two years, both head lights, side lights, and tail lights, with never a miss. But we do not use more than four lights at once. Use 6 volt, 6 candle power Tungsten lamps, wired two in series, which require 12 volts. These will stand 100 per cent. overload and give very fine and satisfactory service.

Reply.—The answer to which you take exception was given on the advice of the makers of this car and not from the experiments of owners, as some have success and others have made a failure of the lighting question as is shown by one of the questions in this issue. You seem to have made a success in this line and we hope that others trying it may be as successful. In making reply, however, to questions of this sort, we cannot afford to ignore the advice of the makers, even though it is known that they naturally oppose changes.

An Expensive Experience.

From F. J. Claussen, California.—I wish to thank Mr. E. H. Van Patten for his article on "Regulating heat of mixture." This is good sound reasoning in the right way and worth the subscription price alone. Mr. O. H. Hampton writes a good article on "Backfiring through the Carburetor," something that has been a mystery to me for a long time as I could never see how it was possible to backfire through the carburetor when the intake valve is closed, but everybody I spoke to concerning this doubt said I was mistaken, but I shall explore this field of experiment to my own satisfaction, as I am already convinced that Mr. Hampton is right and then hope to give a good report to the Automobile Dealer and Repairer. But as all this is taking and not giving, and whereas "the Lord loveth a cheerful giver," I wish to contribute my mite to help others and write my own experience on starting and the spark. I owned a four-cylinder car, the best and highest price made in America and prided myself on starting on the spark. Of course my timer was set just so and I have known my car to start on the spark after standing all night. One day a party came along with a little Locomobile 20 h.p., or rather I towed him to my shop for repair, and before I got to repair his car we traded cars, as mine was a big, heavy car and I wanted a small one. In the evening I borrowed my old car from the present owner to drive two miles to collect some money due. I got to the place all right, but coming home I had to stop on the roadside to let a prancing horse by. Of course when the rig was by I started up on the spark for the last time, my crank shaft snapped like a match. I had to be towed home. Of course the new owner refused to take the car not-

withstanding the fact that I promised to replace the crank shaft. The result was a lawsuit. Of course I won the suit, but my lawyer charged me \$50, a new crank shaft \$161.10, expenses \$11, total \$222.10 for starting on the spark. Rather expensive fun. So I think I have paid well for my lesson, but if this will save some one of getting into like trouble I shall be glad.

The Maxwell Dry Cylinder.

From L. F. Pratt, Ohio.—Several months ago I saw a request for a remedy for the model "Q" Maxwell's front cylinder going dry. I enclose a positive remedy as I have used it since June, 1910, having run over 8,000 miles and never had to supply oil to crank case, except over 1,000 miles. I wipe out old oil and put in fresh with one level teaspoonful of flake graphite added to each cylinder compartment.

Remove the crank case plate on the carburetor side, make a trough of copper or galvanized iron about the depth of a lead pencil and long enough to reach the length of crank case plate. Rivet this so the front end will be as low as possible and the rear end as high as possible. The rotation of cranks will throw oil in this and run to the front cylinder compartment. The front crank throws back to No. 2 and so on. This keeps the oil circulating and will maintain a positive oil level in all four chambers.

One Kind of a Guarantee.

From J. W. Blose, M. D., Pennsylvania.—I have been a reader of your journal for several years because I believed that it was published for the use and information of automobile owners especially. Having had a little experience with a "5-year guarantee" article, I beg leave to submit the following facts with a view of informing the purchasing public, and securing some data from the manufacturers as to what is meant by a "5-year guarantee." I purchased a speedometer some eight months ago from the local agent here with the understanding that it was guaranteed for five years, and that if in that time it failed to work average well, or as well as such an instrument should, they would make it right. Three months' use broke the cable. The local agent sent it to the makers to replace it (so the agent said). I received a different kind of a cable—not made for my speedometer—with a soft solder end that had to be fitted to my instrument. This replaced cable soon broke off from its attachment to the front wheel and parted with the inside chain and was of course useless. Instead of asking the agent to repair the parts I returned it to the factory in Chicago, giving them the number of my instrument and date of purchase, and some ten days later I received the same cable—repaired with charges \$1.50, express 35 cents, 15 cents express return charges. I take this method of bringing this matter before the manufacturers and public so that we may know just what a 5-year guarantee means to the purchaser.

Polarine Oil and Spark Plugs.

From F. R. Marrs, North Dakota.—I do not think I know it all, neither do I think that any one of us can ever learn all there is to be learned. Please tell our "Friend from New York," that the Standard Oil Company sell Polarine in the auto oil style, in three brands, viz.: light, medium, and heavy, and in the grease form in three brands also. If our friend had not been in too much of a hurry to tell me to stop using this oil, he would possibly have had time to have looked the matter up, and then his attempt to advise would not have been so laughable. I refer to the answer to my request, printed in your March issue, page 64.

Also replying to your correspondent, Mr. W. W. Van-Nostrand, N. Y., beg to advise that I do not think his answer to my inquiry would help the trouble, as the oil would flow to its own level, and still be too high in front if the oil was too high in the crank case, even though it was put in in the hand hole on transmission case. I tried this myself, without any help. Will say however, that I hope to have found a remedy, and if this is not too long, will tell you what I have tried.

I wrote the Ford Company and was advised to try the following, and have acted upon their advice, with something added from my own experience. I removed the baffle plate from across the transmission case immediately in front of the fly wheel, and then laid this case in a level position and filled it with water after measuring the exact distance that the cranks would reach down into this case. I noted this distance, and kept record of this, and then plugged up both of the pet-cock holes, and reset these so that the oil level would be just right, and now, when I try out the motor, I find that it oils fine with $\frac{1}{8}$ inch of oil for the cranks to dip into as the running of the car will cause the oil to vibrate considerably, and that will help to raise it, too. I have not had a chance to try this out fully as yet, but will advise your readers as soon as I do.

I do not believe all of the talk of special spark plugs that I read in your paper, as well as several other papers that I read, for the reason that Brown says, "use the breech block," Jones says, "don't use anything but Red-Head," Smith says, "the best is sootless," and I find that while all of these plugs are all right under certain conditions, there is no way whereby they will give satisfaction in this car, unless the sparking points are all nearly exactly alike. I mean the spark gap. I have tried all the best makes with varying results and now, I am going to try the "Ball-Multi" spark plug, as it has a solid ball in its lower center, that keeps the spark gap exactly the same all the time in all the cylinders, and I think this is what causes a good lot of the spark plug trouble.

Starting on the Spark.

From E. H. Sheldon, New York.—It is, indeed, with interest I have read the various articles appearing at different times in automobile trade papers, regarding the advisability of starting "on the spark." I have been and am surprised that although every writer believes such an act to be detrimental to the mechanism, up to the present day I know of no instance wherein it has been undertaken to clear away the misapprehension under which nearly all writers appear to me to be laboring.

Familiar, as no doubt these learned gentlemen are, with the resiliency of atmospheric and gaseous bodies, it seems strange that this factor of resiliency takes no part in their calculations at all. Neither do they consider the interval of time which is necessary for the gases to expand and reach a degree of pressure sufficient to overcome the inertia of the reciprocating parts.

The point I wish to make clear is this: From the time of ignition and until the exhaust valve opens there is a gradual rise and fall of pressure in the cylinder which is firing, due to the gradual expansion of the gases which are burning. Although this is accomplished very quickly, at no time does it in any way compare with the effect produced by a 331-pound blow. The hammer-blow is a case of a non-resilient body striking upon a similar one and would undoubtedly result in a broken piston.

Another point which seems to have been disregarded is this: The piston in the cylinder next in order to fire is half-way up on the compression stroke at the moment of ignition, and the gas in that cylinder is still at atmospheric pressure. Consequently there is less than half

of the full compression in that cylinder to be overcome by the expanding gases in the cylinder in which the combustion is taking place.

Furthermore, as the compression increases in the cylinder next in order to fire, there is also a gradual increase or rise of pressure in the cylinder which is firing which overcomes this, so that instead of its being an abrupt sledge-hammer-like blow which starts the motor from the spark, I trust the aforesaid learned gentlemen will readily see, that it is the gradual, although rapid, expansion of a confined, resilient gas.

It would be absurd to attempt to illustrate the principles of effective combustion of gases in a gas engine by setting a crank shaft in motion, with connecting-rods and pistons attached, and then keeping it in motion by striking the pistons with a sledge-hammer as they passed the top center.

Favors Spur Gears.

From Betsey Bobbett, New York.—On page 45 of your current issue Mr. C. J. Pembroke in his very readable article speaks as though the spur gear differential was always inferior to the bevel gear. My opinion has always favored the spur gear because:

1st—Where it is possible to use them spur gears seem always better than bevels.

2d—The axles of the gears, when spurs are used, are all parallel to the main axles and can be easily made true and well supported in their casing. The axles for bevel gears must be radial, therefore more difficult to make and support.

3d—The case containing spur gears can be a flat cylindrical box having the cover dovetailed in and of a very perfect form to take the big gear ring. The casing for the bevels is usually spherical.

A few years ago spur gear differentials usually had gears of fine teeth and the bevels had coarse teeth. At that time I should have favored the bevels for their rugged strength. At present spur geared differentials are made with coarse teeth and fully as rugged and strong as any having bevel gears. Both forms can be made which are thoroughly good, and if equally good it appears to me that the spur geared differential will cost less to make, cost less to repair and keep in order and also be more compact.

Low Powered Cars.

From G. H. Curtis, Michigan.—I wish to commend the article that appeared in the same number from Joseph O. Michaud of Maine, entitled Low Powered Cars. I think that his idea is correct and have often wondered why only two forward speeds were usually given on the small cars. I am driving a Brush Runabout. I have all the power that I need if only I could use it. But going up a grade or in the too sandy road I cannot use the power I have. I can not quite handle the load on the high gear as the engine slows down until I cannot develop the power the engine should give. I could easily make it often at the rate of ten or twelve miles, but my machine will not permit me to do so, I must crawl along at the rate of five or less.

I wonder if there is any mechanical reason why the small car cannot have the three forward speeds as well as the large cars. If there is any small car on the market that has the desired number of forward speeds I would be pleased to know its name.

Electric Lighting and Cutting Gaskets.

From N. M. Baldwin, Connecticut.—In reply to Albert J. Gauvreau, Vermont, in regard to electric lights, I had my lights changed to electric lights and used a Columbia

multiple battery, type 356, which gave perfect satisfaction. I used 2 c. p. tail, 6 c. p. side and 16 c. p. head lights. I did not use the side lights when the head lights were on. These lamps were 6 volt Tungsten filaments.

I have also had much trouble in cutting small gaskets. It is easy to cut the outside but is often difficult to cut the small hole clean. Now I put the packing between two pieces of board and clamp them firmly in a vise (they could be screwed together lacking a vise), and bore the proper size hole with an ordinary carpenter's bit. This results in perfect gaskets every time, as it is very easy to cut the outside to coincide with the hole.

The Deadly Garage Poison.

William Winrow of Somerville, Massachusetts, was recently engaged in running his engine in a small ill-ventilated garage. He was at work attaching a vacuum cleaner to his engine and was under his car. His son went to call him, but received no reply and was much alarmed to see dense volumes of smoke or gas emerging from the garage. Some one rang in a fire alarm but when the garage door was finally opened the interior was found full of smoke and gas and Mr. Winrow was dead under the car. The engine has stopped; apparently for want of air. Mr. Winrow's body was found by a first aid man connected with the Somerville fire department. This man made strenuous efforts to resuscitate Mr. Winrow, working for more than half an hour, but all these efforts were in vain. A physician, who was immediately called, said that death was caused by hydro-carbon poisoning and the death certificate was issued with that entry.

Steam Vulcanizers.

From A. C. Doane, Illinois.—I notice in your March number, No. 509 asks about vulcanizers. I have had considerable experience with the steam vulcanizer and will say with only one make, that is the National. I have had very good luck with it, or as I would state to one who contemplates using one, it is not luck. I find that if the simple instructions sent with it are followed, this is all that is necessary to enable one to do first-class work with it. To be sure, if the heat is allowed to run much higher than it should it cooks the rubber too hard and it will crack and not last. On the other hand if it is not allowed to run high enough it will be undercooked, and too soft. But if kept within the range given in the instructions, it will be most satisfactory. I would not be without mine. I consider it the most economical asset I have for my machine. I would say it looks reasonable that the steam vulcanizer would be the better one to use, as the heat being a moist heat instead of a dry one, should be better for the rubber. Now this is not an expensive asset and I think any person who wishes to spend a little time and cares much for expense would be very highly pleased with it.

Impure Gasoline.

From John C. Glade, New York.—I have read with considerable interest a letter from a correspondent, in the March issue of your valuable magazine, regarding his trouble with gasoline. I had an experience last fall along similar lines. I have a 60 gallon, galvanized iron, underground tank, from which I pump my gasoline supply. While drawing gasoline one day during the month of October, I was surprised to see that the liquid was opaque instead of clear, being of a dirty milkish color. On letting the gasoline stand for a short period the opaque matter, which after settling, resembled, as your correspondent aptly put it, frog spittle, while about one-half of the liquid, at the top became clear. The dividing

line between the upper clear liquid and mess on the bottom was sharply defined. About 30 gallons in the tank at the time were thus affected. I drew out all of the gasoline in the tank and after it had settled, poured off the clear liquid on top, which on test showed a specific gravity of about 61. As I had used some of the same gasoline, but a few days before, when it seemed O. K., I was puzzled by the occurrence. I poured a quantity in a tin dish about 6 inches deep and found that the top layer of gasoline extended down about three inches. Under was a layer of water about one-eighth inch deep, while the balance was comprised of the thick mess mentioned. My first surmise was that some water had entered the tank through a possible leak on or near the top of the tank, but the presence of the slimy matter is beyond my understanding. I hope you can throw some light on the mystery.

The Maxwell Valve Timing.

From Thos. J. Foster, Maine.—No. 510, referring to the inquiry of Edgar T. McCall, New Jersey, the remedy for lateness of the opening and closing of the valves in his Maxwell is to move ahead the gear on the cam shaft from one to three teeth. This will not lengthen the time the valves remain open, but will only change the point at which they open and close. The marks on the gears are arbitrary and it is possible they were never exactly right. There is an individuality to all machines and gasoline engines are no exception. For example take two shot guns, made by the same manufacturer, exact duplicates as far as can be seen and measured. One will scatter shot over a large area and the other will not do so, but throw the shot all in a bunch. The gear marks are made by some man, and as none of us is perfect, the mark may not have been right at the start. From the standpoint of the writer, the thing for Mr. McCall to do to compensate for the wear of the cams, is to move the cam gear ahead, one tooth and give it a trial. If it does better give it another. It is an easy matter to do this and will do no harm any way. The writer has a Maxwell tourabout that has already run five seasons and is doing as well as ever. The timing gear is now three teeth ahead.

Cut the Crank Shaft Bushing.

From Dr. Virgil L. Casto, West Virginia.—Will you please tell me what is wrong with my auto-buggy? It was made by the Black Manufacturing Company of Chicago, Ill., and is model No. 112. The motor is double cylinder, said to be 14 h.p., horizontal opposed, four-cycle type, air-cooled engine. Has not been in use more than three months and has cut the bushing of the crank shaft where the connecting rod joins it three times and each time there was plenty of oil. At times the engine wont pick up and by changing the actuating rods a little it runs all right. I would be very glad if some of your readers would tell me what is wrong. The cutting of the bushing has been the worst thing I have had to contend with.

Reply.—We are not at all familiar with this car, but the scoring of the crank shaft would seem to be caused by some fault in the alignment—the springing of something that causes a binding where the bushing is cut. Possibly some of our readers may be able to give better advice out of their own experience with this car.

The Skipping Buick.

From Murry Fahnstock, Pennsylvania.—If J. A. D. (Number 480) will substitute a new dash coil for the one now in use on his Buick Model 10, he may eliminate

the skipping of which he complains. In one repair shop, which specializes in the repairing of Buick cars, one of the first things tried, when the motor skips, is the substitution of a new coil. As this coil is common to both battery and magneto on this car, switching over from battery to magneto does no good.

It might perhaps be advisable to warn Buick owners against substituting a storage battery for the four dry cells which are sent out with these machines. A storage battery has too high a voltage and will overheat and melt out the insulating compound in the coil. I have seen coils that had the wax running down over the dash and were thus unfitted for further service.

A Simple Fire Extinguisher.

From F. M. B., New Hampshire.—I have taken much interest in your suggestions and communications under the head of your trouble department. I have at various times read therein a great many recommendations for extinguishing gasoline fires, caused by back firing, etc. Some suggest sand, others smothering, and various methods have been named, all of which have some merit.

For the benefit of your readers, thinking possibly I may aid somewhere I have received so much assistance, I wish to state that no one need have trouble from fires caused by back firing, or in fact any fires arising from gasoline or around the engine.

Purchase a six or eight ounce vial of spirits of ammonia. Place it in the tool box or in some convenient place, and you have a perfect fire extinguisher. It is a good idea to have a rubber stopple so that the ammonia will not destroy it, and it can be removed quickly. Remove the stopple, place your finger over the end of the bottle and sprinkle quickly over the fire and it will act instantly, and will be found better than most of the "fire extinguishers" so called. It is inexpensive, and is positive in its action on a gasoline fire.

Remedy for the Skipping Buick.

From F. R. Reiter, Nebraska.—In the March number on page 63, J. S. Minor refers to a trouble that I have been up against, with the model 10 Buick, the indications being exactly the same. I tried the same things he says he did except I did not send my magneto back to the factory. However, I found the trouble to be the distributor. By removing the cap that is held to the distributor by the two flat springs, I found that the coil spring which is attached to the part that makes contact with the distributor was jammed together so that it did not hold the part up against the plate. I stretched this spring out about a quarter inch, cleaned off the the end, and placed all back. I then started the engine, readjusted the carburetor, and all runs smoothly.

Takes Troubles to the Owner.

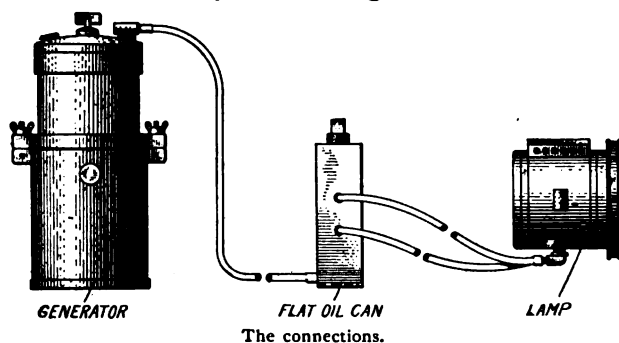
From Wm. B. Yoder, Ohio.—I have a Ford Model T car and I could ask questions in regard to my car, which I have already, but instead of writing to the auto journals I take all my troubles to the maker of the machine. He is more interested in his goods and the good working of it than anyone else. When my car doesn't work to suit me and I can't help myself out of the trouble I write to the Ford people. I always get a prompt reply and they tell me just how to get me out. I think every Ford owner should do likewise, because they are the makers and know that satisfied customers are the best advertising they could do and it is a source of satisfaction to them to know that the Model T is doing what they claim it will do. This is why I have not asked any questions in your journal.

That Cranking Trouble.

From F. A. Curtis, Florida.—Am enjoying your magazine very much, especially the "Trouble Department." Kindly inform Mr. Miller, No. 514, last issue, to take a cloth rag and put it over the air tube under the primer (after priming) and his trouble about cranking will end. Also tell him not to forget to remove the cloth or his engine will not pull its full strength.

Gas Plant Trouble.

From F. J. Claussen, California.—In looking over the January issue, I find a query from Mr. H. J. Buckmaster, concerning trouble with the gas plant. I have had the same trouble and did everything but the right. I have worked with the generator, burned up carbide galore, throwing away burner after burner and no relief, until a happy thought struck me one day. I found when taking the generator apart that the water flowed freely and the generator was almost



ready to explode. Blowing through the pipes found them clear, but the burners were wet. In fact, when I lighted them I found that only one would burn. The other just sizzled. My remedy was the following: I took a flat oil can, the kind especially made for side door pockets, soldered up the spout and cut in the holes as per drawing. Solder in the short pieces of tubing to connect from the generator to the can and from the can to head light, thus the gas accumulates in the can and the water drops in the can and cannot get to the burners and now my troubles are over. I don't use one-fourth the carbide and my burners need no care and my lights burn as long as there is any carbide left. If Brother Buckmaster will rig his generator the same way he will be pleased with the result.

Storage Battery Charging.

From the Willard Storage Battery Company.—In the March number, page 62, No. 493, we have read the reply regarding storage battery charging. The reply is correct as far as it goes but it does not go far enough. Voltage reading is not always a sure indication that a battery is fully charged. For instance, if the charging rate is too high, it will result in heating up the battery and forcing up a kind of false voltage and when your battery is taken off the line and allowed to cool you will find that the battery was not thoroughly charged after all. A much better record of the battery's condition is obtained by using a hydrometer syringe which will show you the chemical condition of the battery and is not affected by temperature. A gravity reading on the hydrometer in addition to voltage reading will give you information you can depend on.

Has No. 493 ever allowed his battery to stand for several days in a fully discharged condition? If so, it would be necessary to put the battery on charge at a low rate and leave it on for a long time, at least

72 hours. If the battery has been allowed to stand several months in a fully discharged condition the plates are probably covered with a hard coating of sulphate which no amount of charging can reduce. It may be also that the proportion of acid to water is not correct and this again can only be remedied by applying the use of the hydrometer. It may be that he is using a battery having too low a discharge rate for your lighting service. Some owners do not get satisfactory service from electric lights for this reason. Indeed, owners have been slow to learn that lighting service is entirely different from sparking, that for good lighting the battery must be one which has been designed especially for lighting service.

Of course we do not know whose battery or what size No. 493 is using, but we are interested in having every user of electric lights get satisfactory service and he certainly can get it if he uses the proper battery and his installation is all right.

The hydrometers we carry in stock are large ones designed for use in electric car batteries and train lighting batteries. These sell at \$5 but small ones can be obtained from the Storage Battery Supply Company of New York City.

Favors the Two-Cycle Engine.

From a two-cycle enthusiast, Pennsylvania.—In reading over the March number I came across your answer to "A New Enthusiast," Ohio, No. 498. It struck me that in your description of the two-cycle engine you was not quite fair (unknowingly, no doubt) to the Elmore two-cycle car. If you would send for their 1911 catalogue you will see that in their present new "High Duty" motor the compression no longer takes place in the crank case, nor does the gas enter there at all, an entirely separate chamber being used. I thought you might like to be set right in the matter. I might add that I have had two Elmores of the new type—last season and this—and consider that such objections as there were to the two-cycle type have been overcome, as I have had perfect satisfaction so far.

Clean Spark Plugs.

Sooted spark plugs are frequent, and an account of the way in which this tendency may be combated should interest many novices. If a long-nosed plug be used, the evil may be overcome by threading two or three ordinary spark plug washers on each plug, in lieu of the standard single washer, always provided that the thread is long enough for the purpose; at least four threads should project beyond the washers. The effect of fitting several washers is to raise the plug higher in its orifice, so that less oil is deposited on its business end. The writer actually uses short metal collars, threaded externally at their lower extremity to fit the engine, and externally at their upper ends to carry the sparking plugs. The scheme recommended naturally reduces the compression ratio of the engine a trifle, but the loss is not greatly appreciable. In fact, if the car is used for prolonged climbing work on low gear, the reduction is an advantage, and assists engine cooling.

Cam Shaft Trouble.

From M. W. B.—In the course of a long run the power of one cylinder was found to be gradually failing, and eventually ignition entirely ceased in this particular cylinder. All the usual remedies and examinations were made, but ignition, spark plugs, valve springs and tappets, etc., were all in perfect

order. In turning the engine with one compression tap open at a time, number three cylinder apparently had two compression strokes in the usual cycle, viz., two revolutions of the crank shaft. This naturally caused a great deal of perplexity, until after many hours examination it was accidentally noticed that both inlet and exhaust valves opened at the same time. More examinations followed, and finally the trouble was traced to the exhaust valve cam shaft. In the engine in question the cams are not formed in one piece with the shaft, but each cam is secured to the shaft by a large taper pin passing through both cam and shaft. One of these pins had sheared, and allowed the cam to turn very gradually on the shaft. In turning thus it had torn the shaft somewhat so that it became jammed firmly in an incorrect position, causing the exhaust valve to open at the same time as the inlet. The gradual falling off of power was no doubt occurring when the cam first came adrift and began to work round the shaft, so affecting the timing of the valve more and more.

Oil and Graphite Lubricants.

From Charles E. Duryea (pioneer automobile man), Pennsylvania.—You can say to Mr. Morris (December issue, page 1314), that a teaspoonful of graphite to a pint of oil will suffice. The graphite does not wear out; one-third of one per cent. by weight, to be more accurate. This can be seen in a good light and helps avoid friction and keeps the engine cooler. The oil can be put into the tank with the gasoline and after a time will dissolve, but if the oil is thick or the weather cold it is best to stir it. I prefer to mix in the supply tank or barrel and then I know that no undissolved oil goes into the carburetor or lies in the bottom of the fuel tank where it can do the engine no good. Try a little in a bottle and see just how quickly it does dissolve. Thin oil will mix immediately.

Likes the Magneto.

From Presley Smith, St. Louis, Missouri.—Some-what over a year ago we purchased a three-cylinder Chase commercial car which since in our possession has given entire satisfaction, in fact it has exceeded our expectations in regard to service and durability. We operated our car with an ignition system which gave us considerable trouble and difficulty and we decided to install a Bosch Magneto. We are well pleased with the same and candidly state that since the installation of the magneto all the petty annoyances and embarrassments we had to contend with formerly have been entirely eliminated and the engine now responds to our every beck and call like some faithful dobbins.

The Editorial Cylinder Head Overhauled.

From Fred Grundy, Illinois.—I intended to subscribe just as soon as I got ready. I am ready and the simoleon is herewith. I read the papers you kindly sent me and found them much like all the rest. I got little practical information from it. One article in it said salt was a good thing to clean the carbon out of cylinders. I tried it as directed and plugged them up so nicely that I had to work a whole day to clean it out. Out there in my garage stands a little Maxwell Runabout that run about nicely for a couple of months after I got it and then took a spell like a chorus girl and refused to go one way or the other. I read the "instruction book" over a few times, then

got your magazines out and read them, and finally decided that I would have to give it up and walk. And I did. In a distant city I called on an "expert" and described the case. He lit a cigar and looked just like a doctor who has diagnosed a plain bellyache as appendicitis and was ready for an immediate operation. "Ah," said he, "your car should be overhauled at once by an expert." I told him I thought so myself, and I would be glad to have him examine its bowels and liver and things, and ascertain why it did so much coughing, sneezing, bucking, balking and acting like a spavined, windgalled and unprincipled broncho. Would he state his price? He assumed a disinterested air and said: "I'll overhaul 'er for \$50." I didn't have the sequins in my jeans, so I told him I'd see him subsequently, which period has not yet arrived. I again resorted to your journals and found some interesting matter that did not give any information, and the machine is still "At Rest."

It needs fixing. There is no reliable auto tinker here, and it looks like I'll have to tackle it, but, as Jones says, "I'd rather be kissed to death by a nigger wench than do it," because I'm not an engineer.

The fact is, Brother Editor, the cylinders are clogged with carbon. I got some Presto-carbon Remover and tried it according to directions without result. If your journal would tell me how to get that stuff out and keep it out, without taking the thing down and getting it all mixed up I would proclaim it a bird. If it would tell me whether the "Asco" spark plug is better than the "Westchester" I would think I had struck a mecum. If it would give me a whole lot of such plain information that would make light the dark places, or, in other words, illuminate the viscera of that machine so that I could administer the necessary cathartic, tonic, restorative or elixir to make it operate properly and move on I'd have a long session of hilarity.

Horse Power Formula.

From Dr. M. B. Stine, Iowa.—I have noted how many writers and engineers disagree as to how to figure the horse power of gas engines having different size cylinders, so I submit the following formula as being nearly correct and applicable to all sizes of engines: Square the diameter of the cylinder, and multiply by the length of the stroke, then by the number of cylinders and divide this product by 100. With the engine running at 1,000 R. P. M. this comes nearer to estimating the actual horse power than the A. L. A. M. rating.

Closed Garage Danger Averted.

From Otto Klaffke, Wisconsin.—Your journal has saved my life. Being inexperienced, I ran my car in a closed garage, and after getting a good gasoline "jag" I sat down to overcome it. It then came to me that your paper stated a case of a Chicago doctor having been found dead in the garage. This brought me to my feet and I crawled out. Thank you.

A Painting Query.

From F. R. Marrs, Wolford, North Dakota.—I would like to hear from experts on re-painting autos, that is for a complete job on an old car, and what is best to use in the way of materials, and the best brushes for the striping, and how a coal black with light green striping would look.

Keep the air pressure in the tires up to the amount specified by the makers.

CERTAIN TROUBLES.

Good Points Which Car Operators Will Do Well to Read Carefully.

From Charles England, Indiana.—After reading of all the troubles had by users of the Model T Ford cars and the suggestions made by readers and your expert, I thought it time to give readers my own experience concerning the Ford rear hub pins. They will break in most of the cars and the easiest and best way to remedy their defect in design is to use pins made of $\frac{3}{8}$ round soft steel rod, filed so it will be a loose fit in the hole. These soft steel pins will not break unless bent many times and they will also hold the wheels on just as well as the pins which come in the hubs, which are entirely too hard.

Owners who have Ford cars and are troubled with a roaring and rattling sound at certain speeds, say from 20 to 25 miles per hour, can in most cases stop this noise by removing the semi-fluid oil from the differential housing with a grease gun and then filling the housing with heavy Polarine grease or any good heavy grease that will not become a liquid after being in use for a time.

If owners are troubled with grease working out on the right gear wheel it is nearly always caused by oil running from the transmission case down the drive shaft housing into the differential or rear axle housing. To prevent this do not fill your crank case so full of oil and keep the universal joint full of heavy grease so the oil will not pass it. An excellent spark plug for the Ford is the "power plug." It is very easily cleaned, has nice insulation and will last for 10,000 miles if given proper care. I find that nine-tenths of the trouble with Ford cars are dirty or broken spark plugs, platinum point of vibrators stuck, pitted, or out of adjustment, timer wires broken or loose or carburetor out of adjustment. Keep the platinum points filed smooth with a fine flat file, clean the spark plugs as often as they get dirty, adjust the carburetor and the Ford T has all the power and speed the sensible man wants.

Owners of Ford cars built in 1909 that use a great amount of cylinder oil and smoke a great deal, and dirty spark plugs, should when the motor is again taken apart drill out the hole in the baffle plate to $\frac{3}{4}$ inch or 1 inch then with a hack saw saw the oil dippers off of the lower half or the connecting rod boxes. The motor will not use more than one-half the amount of oil that it did before and will also be well lubricated.

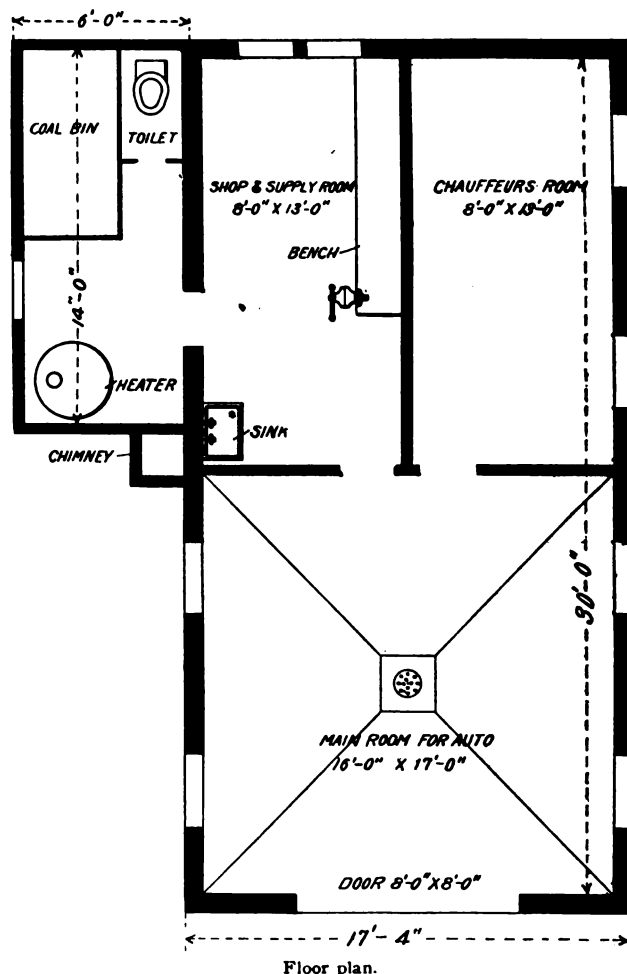
I disagree with A. D. Oldknow, Penn., concerning the injury done to a motor by starting on the spark. There is little or no comparison between the blow struck by a sledge and the explosion of gas in the cylinder of an idle motor. The pressure or power that starts the idle motor is more like steam than any hammer blow, if it was not the pressure but a blow that propelled the gasoline motor it would pound itself to pieces in thirty minutes or possibly considerably less time. Any motor that is compelled to labor when climbing a hill with spark advanced receives a shock many times greater than it would receive when starting on the spark. A four-cylinder motor almost invariably stops with all pistons at the center of their travel so the explosion need turn the motor only $\frac{1}{4}$ revolution then it will turn another $\frac{1}{4}$ by the compression on another cylinder. I have an 1909 Model 10 Buick that seldom refused to start on the spark when warm and I do not believe it could be injured in the least by so doing.

A Well Arranged Garage.

From S. W. Bowker, Maine.—I enclose plan, sketch and list of material for garage 16 x 30 feet inside, 8 feet high to eaves, 3 feet to be of concrete wall 8 inches thick with 5 feet of 2 x 3 studding on top of wall and wood finish above.

The inside contains main room for auto 16 x 17 feet, cement floor, with two inch slope to the center for drainage, which may be connected with the sewer or a catch basin dug outside the building and piped under ground.

Two rooms, each 8 x 13 feet, are partitioned off in the rear, one for a shop and the other for chauffeur; a lean-to is built 6 x 14 feet for heater, toilet and coal, thus removing as far as possible any liability to ex-



plosion, by having two doors. Bench with vise, oil, shelves and closets are to be placed at the discretion of owner.

Roof of lean-to may be a continuation of the main building roof. This addition is to have a door with glass panel, and slide for coal if wanted. Outside finish is siding nailed to 2 x 3 studding, bedded into top of concrete wall 2 x 4, by placing spikes on two sides, driving them halfway in. Let the top come flush with the inside and top of the inner form; outside form to be one inch lower and concrete neatly troweled to a level for water table. Inside finish to be galvanized iron, painted or plaster board. Entrance doors having glass panels are hung on easy running inside tracks.

The 2 x 4 around the building on top of concrete wall is to nail studding to. The gasoline tank is to be buried outside and piped under the wall to a pump in the large room. When desired a basement under the

two small rooms with heater there might be safer. This building two feet longer with doors on the side of double construction will accommodate two cars.

Estimate of Cost.

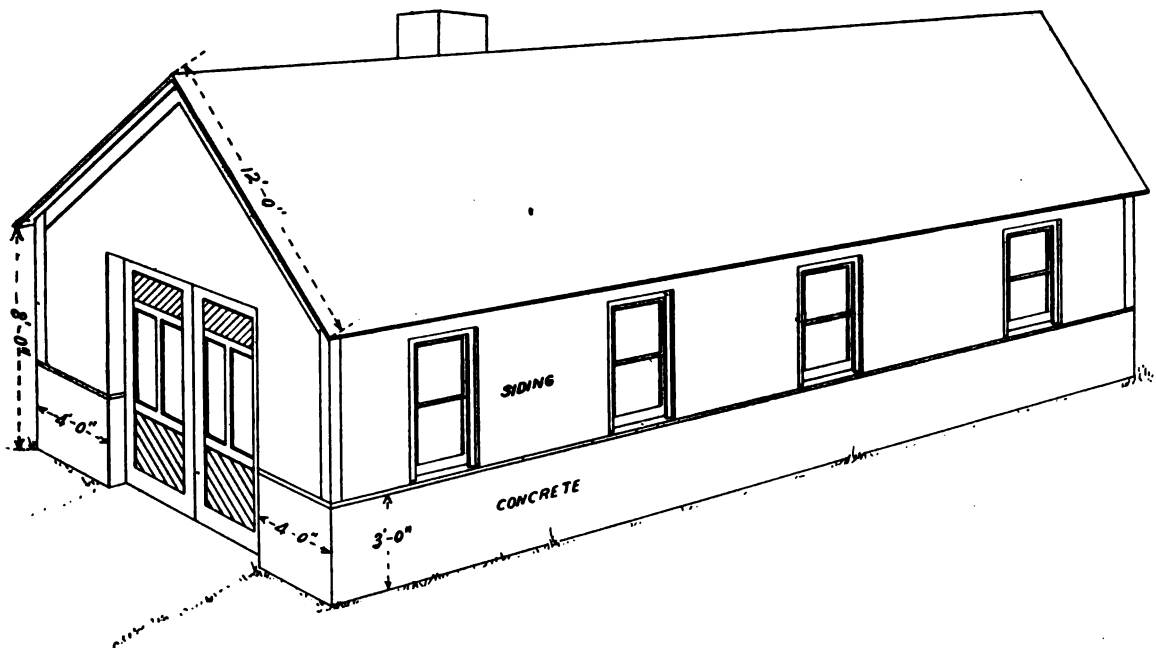
Foundation and three feet of concrete wall...	\$85.00
Concrete floor	35.00
Drainage	25.00
Water	20.00
Chimney	25.00
Heater	75.00
40 pieces 2 x 3 in. x 16 ft.....	9.10
50 pieces 2 x 4 x 12 ft.....	11.20
6 pieces 2 x 4 x 16 ft.....	.90
550 feet of siding, at 40c.	22.00
750 feet of roof boards, at 28c.	11.00
250 feet of corner and finish boards.....	8.50
7 sash and frames, weights and cord.....	16.00
3 inside doors and hardware.....	5.00
2 entrance doors	20.00

SECOND HAND CARS.

Some New Points Intending Purchasers Will Do Well to Consider.

From O. H. Hampton, Indiana.—Nothing in the following article is to be construed as casting any adverse criticism on any honest man or firm that handles second hand cars, and the writer is glad to say that there are many of them. The sole object is to try to protect prospective buyers of second hand cars who know little or nothing about the quality of the goods.

That there are many bargains to be had in second hand cars is true, but it is also a fact that unless the buyer is well posted on cars in general; posted well enough to know exactly what he is buying, it is possible and in a good many cases, certain that the seller is the man who will get the bargain. For a man who knows practically nothing about motor vehicles to



Perspective plan, Mr Bowker's garage.

1 outside with glass door.....	3.00
Roof covering	65.00
Inside finish	50.00
3 pieces 2 x 6 x 16 for tank and benches.....	1.40
Labor	112.00
	<hr/>
	\$600.60

A popular form of the automobile body now is with shield running clear up over the steering wheel and protecting the driver and the person on the other front seat. It looks very much like an apron tied up to the neck of the car.

"The reason an automobile runs better on damp days than on some others," said a university instructor lecturing to a class, "is because of the greater amount of water vapor in the air. This is a help to the explosive qualities of the mixture."

No dampness should be allowed in the garage. If it is, it will cause a great deal more labor to keep the brasswork bright and clean and it will also corrode part of the machinery.

buy a second hand car from a dealer or a man whom the buyer does not know to be entirely truthful and square, is about as risky an investment as he could make. There seems to be a certain percentage of humanity who make their living off the ignorance of their fellow men, and as the second hand motor vehicle trade affords exceptional chances for this sort of game, there are men to be found in it, men who are plausible talkers, and a good many of them possessing that natural and valuable gift of making strangers believe in them and inspire confidence in them, regardless of whether what they say is true or false. Of course a demonstration, which appears to show that the machine is all right, is the thing that settles the matter beyond doubt in the mind of the ignorant prospective buyer. He does not know that a machine that is really almost a junk pile can be overhauled and cheap repairs made that will show the machine in good shape for a hundred miles or so. But after that the machine gets back into its old condition, and from that time on one thing after another gives out, going wrong somewhere, and constantly demands the services of the machinist. The buying of new parts from the manufacturer of the machine, and the buying of

repair parts follows, and the buyer soon finds it is in many cases a downright robbery.

A few days ago the writer had a letter from a firm that has been making motor vehicles for ten years. This letter says that the usual price charged for repair parts is the actual cost plus 200 to 400 per cent. profit. It is a fact that the firm that has sold 5,000 or more cars has a splendid income from the profits on the sale of repair parts alone, if they never sold another machine. The only reasonably safe course for the ignorant buyer to pursue is to buy only from a person or firm that he knows is responsible and whose business integrity is beyond question, or if he has a neighbor or personal friend whom he knows to be all right it will do to buy from him.

Do not buy a machine that is offered at any ridiculously low price. As a general thing, a machine that is offered at less than half what it cost new is not worth buying at any price. Do not expect after buying a second hand machine that it is going to give the service that a new one will give, or there will be disappointment. If the machine has been used five years, it will not last as long as a new one by five years. It depends a good deal on the man about the satisfaction to be got from a car that has seen its best days. If he is a man who has to depend on someone else to keep the car in order, he will find the constant expense unsatisfactory. It will cost more than the interest on the money that would have bought a new car.

If on the other hand, he is a man with a reasonable amount of mechanical talent and time to spare, he will actually take pleasure in "tinkering" with the car and overcoming the "cussedness" that will periodically show up, and it will be a good training for the time when he will buy a brand new car, for he will then know how to take care of the new one, and he will in all probability be able to make the new one last much longer than if he had had no previous experience. It is surprising what a man with a good mechanical head on him can do with just a few tools and some ingenuity.

REPAIR WORK.

Wiring for a Low Tension System In Use for Some Time.

From J. N. Bagley, Nebraska.—Ezra Hopkins, known the country over as "Uncle Ezra" and a dandy good fellow as well as good mechanic, seemed to never want to get tangled up with the automobiles, but he did and he can handle them a great deal better than many of the young men. Uncle Ezra had a gas engine in the shop to run the grinder, drill, blower, etc., and had become accustomed to their little tricks and had no trouble to keep them running. While I was in the shop one day visiting, a farmer came in to the shop in rather a hurried manner and something like the following conversation followed:

"Say, Ezra, my gas engine has stopped and I have been cranking all the morning and can't get it started. I have two hundred head of cattle without water, and I want you to come out and fix it up for me."

"Well (and he spat clear over the sidewalk), I'll be hanged if you fellers won't want me to move my shop out to you after a while. I—"

"Now, look here, Ezra, this is no joking matter. I want you to go out and fix that infernal machine, I don't care what you charge. I'll take you out and bring you back. I'll do anything, but I want it fixed."

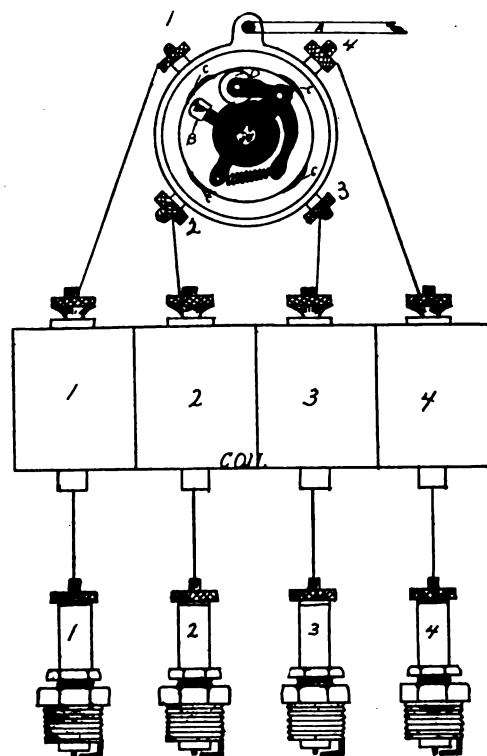
"The idea of me chasing about the country fixing gas engines and letting my work go here at the shop.

It would only be a matter of a few days until I would have no more business than a jack-habbit, and besides—"

"Now, look here, Ezra, I have given you all my business for the last ten years and if you can't help me out in case of this kind I'll be hanged if I don't take my plow lays to Kansas City in a wheelbarrow before I will bring them to your shop. Now gather up some tools and I will have the liveryman take you out in the auto and you will lose very little time."

While the farmer was after the auto Ezra was sputtering around and muttering to himself, "My business won't amount to a snowball in a heating stove if I start this kind of business." In the meantime the auto rolled up and Ezra climbed in. I told him I would hang around the shop and take in the jobs until he could get back. Night came and no Ezra. The next morning just at sunrise Ezra and the liveryman pulled in.

He had managed to get the gas engine fixed up in a little while, but on the road home the auto went



Wiring diagram.

wrong and they worked half of the night to get it to run. Uncle Ezra came home in good spirits and it was some time after I learned that a couple of experts had worked on the engine and could not get it to go. After Ezra had started the engine the farmer told him how the experts had failed to make it run. This made him feel a great deal better.

Ezra has now built a large garage alongside his shop with a sign across the front reading, "Uncle Ezra's Garage." He employs two men in the garage and two in the shop and has a nice little business. He says it is likely he would never have branched out and taken up the business had he not fixed the engine the experts fell down on. It made me feel pretty good and put me to thinking. More mechanics want to get to thinking before it is too late, for some bright morning they will find some fellow with a handful of tools and about that much experience is going to start a garage next door to them.

The following kinks will be of value to the auto

repair man. Occasionally an auto will be brought to the shop with the wiring off—possibly the timer turned three points from where it should be. In this case if the repair man has had no experience along this line it may bother him a little to get the wires back where they belong. I well remember my first experience along this line. I got the wires where I thought they were right and on cranking the motor it would run backward, fire through the carburetor and finally stop. It took me about two days to get lined up and figure out a system, since then I have had no trouble and can wire a motor in just a little while. The first thing to find is the rotation the cylinders fire. This can be found by turning the motor over until the intake valve on No. 1 (the front one) is open and note which opens next. If it is the last one, No. 4, then you have, No. 1 firing first and No. 4 firing second. If the next intake valve to open is No. 3, your motor fires 1-4-3-2.

We have now the rotation which the cylinders fire but must get the roller of the timer in position before we place the wires. Connect the timer to the spark control lever and retard it to its fullest extent. Turn the motor over until cylinder No. 1 is in position to fire, or just a little past dead center. Now loosen the set screw B, as shown in the illustration, and turn the roller in the direction it travels until it is just coming on to contact with one of the insulated points (no particular one). Tighten the set screw securely and begin placing the wires by starting on the post on the timer and have already made contact with. Run this wire to the primary post on the coil marked I in the diagram. Place the secondary wire from the same unit of the coil to the spark plug in cylinder No. 1 (front cylinder) and you have the wiring for the first cylinder. Now we have found the motor fires 1-4-3-2. Of course the next contact the roller on the timer will make will be No. 4 at C, so we will place a wire from the next point on the timer to the opposite unit on the coil and run the secondary wire to the cylinder No. 4 (last one). Next in order will be No. 3. This will take the next post that the timer will make contact with. This unit will be beside No. 4 and the secondary wire must run to the spark plug in cylinder No. 3. We now have but one left and that is No. 2, and we cannot get it wrong. Now that we have the wiring on, crank up the motor and after it runs a few turns stop it by switching off the battery. Switch the battery back on and note if the coil will buzz. If it does, the timer is set right; if not the set screw B should be loosened and the roller turned just enough to make the slightest contact, after which tighten it and again crank the motor and let it run a few turns. Then stop it, throw on the battery, and note if the coil will buzz. Continue this until the coil will buzz after the motor stops and when the motor is hot and only been stopped for a few minutes. It will quite often start by throwing on the switch.

This only applies to a low tension system which has been in use for some time. We will take up the high tension system later and treat it in a similar manner and try and make it plain enough that the inexperienced can understand it without a doubt, while it is somewhat complicated as compared to the low tension system of ignition, but it seems that the high tension system gives much more satisfactory results and does not get out of order as often as the low tension system.

Wipe all oil and grease off the tires as soon as noticed, for oil causes rubber to deteriorate.

WORM GEARS.

They Are Popular Abroad and Are Being Discussed in This Country.

Worm or spiral gearing has been in use for a good many years—possibly ever since the time of Archimedes. It is the smoothest running and most silent gearing that is made and the wear is more widely distributed than any gearing in use. Whether it is the best and most economical for the transmission of power, is another matter, however, and we will leave the solution of this problem to the mechanical engineers.

To what extent the worm drive will figure in the automobiles of next year and the years thereafter is one of the questions that now are confronting the trade. That that form of transmission has been receiving increasing attention has been apparent for some time, but the impression has prevailed that such attention has centered chiefly on the application of the worm gear to commercial vehicles, although it has been known that a few manufacturers, notably the E. R. Thomas Motor Car Company and the E-M-F Company were trying it out on pleasure cars also.

According to a man from the West the number of those who are engaged in similar experiment is much greater than is supposed to be the case even by those familiar with the inside workings of the industry. Claiming to know whereof he spoke he named practically all the older and better known makers who, he said, have obtained worm-gear parts which they are putting to the test on touring cars. In addition to Thomas and E-M-F, among those whom he placed in his category were the producers of such cars as the Pierce, Packard, Olds, Cadillac, Chalmers, Hudson, Buick and Elmore.

The fact that these manufacturers are trying out the worm does not necessarily foreshadow their adoption of it, but that it constitutes a significant trend is undoubted. Further significance is contained in the information that the Flanders Manufacturing Company of Pontiac, Mich., has secured the American rights to produce and use the machinery employed in the cutting of an English worm for which particular advantages are claimed, there being no patents on the gear itself.

Robert M. Brownson, president of the Flanders Company, recently made a visit to England and closed the necessary contracts and the company shortly will be in position to supply the American trade with worm gears or the machinery for making them. Pending the building of the gear cutting machines in this country, several of them have been imported and as a result there will be no loss of time in meeting any demand that may arise.

The Flanders Manufacturing Company includes the Pontiac Motorcycle Company. The English worm gear is proving successful on motor cars and it is not impracticable on motorcycles. It is likely that the Flanders company will not overlook whatever possibilities exist in the use of worm-gear drive for its motorcycles as well as its cars.

Turpentine for Cleaning.

By using a rag soaked in turpentine, grease and dirt are quickly removed and a lacquered appearance given to the surface of the aluminum. It also seems that dirt and grease will not adhere so readily to the aluminum after it has been so cleaned as compared with its propensity in that direction when gasoline has been used.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

Why He Likes It.

From R. S. D., Iowa.—I have owned a Stanley Steamer, Model 60, for a year, and I retain the respect of my family the same as when I used to drive a gasoline car. Nor do I feel any danger of being disfranchised for my heinous crime.

I know of nothing against which there is so much insane prejudice as the steam automobile. Talk to one hundred men about the relative merits of steam and gasoline cars, and 99 of them do not hesitate to slide the long knife under the 5th rib of the steam car, though but few of them ever even saw a steam car. They have been told that steam cars give nothing but grief, and have heard that they blow up. The 100th man has had experience with a late model steam car, or is too fair minded to condemn without a hearing.

I think the worst drawback to buying a steam automobile, in a small town, at least, is the difficulty in finding repair men with practical experience for steam cars. Therefore, the owner of a steam car needs to have a more thorough knowledge of his car than the owner of a gasoline car, so that, whether at home or on the road he can diagnose his troubles himself. I do not admit, though, that there are nearly so many mysterious troubles with the steam car as with the gasoline car. Did I not spend \$30 cash and \$100 worth of time and energy looking for a knock in one of my gasoline engines, which knock persisted for two seasons, and is there yet?

When I got my first gasoline car, all the automobile knowledge in town pertained to gasoline cars, and was at my command. Everyone who knew a carburetor from a tire lug, and some who did not, were anxious to help me out of any difficulty. After four seasons driving of gasoline cars in which time I had two different cars, I ordered a steam car last March. When this became known by my townsmen, I was made to understand by insinuation, innuendo, and direct accusation, that I lacked the slightest trace of gray matter, and was several kinds of an idiot. Only three men in town gave me any encouragement. The rest were waiting to say "I told you so." Only one mechanic in town knew anything about steam automobiles, and that from a model "A" made in the year 1 of the automobile business.

I had trouble—lots of trouble—and a steamer's troubles do look bad to the knockers who forget that the garages are supported by the troubles of the gasoline cars. Yes, I had as much or more trouble than with my first gasoline car. I knew absolutely nothing about steam as a motive power. As there were none to help, my repair men and I had it all to learn by experience, and experience comes high.

Once I felt a little blue about it all and almost wished I had a gasoline car. An hour's ride in a steamer will make a fellow forget a lot of grief, though. In looking over my experience I find that nearly all my troubles have been from ignorance of the working of the car. I flatter myself that I now have my eye teeth cut, and am sure that I have a

more thorough knowledge of my steamer than I had of a gasoline car at the end of four seasons' use.

From April 1 to Feb. 1, I drove my car nearly 7,000 miles through all kinds of country roads wherever a car would run at all, and it shows just as much power, speed, and snappiness as when I first opened the throttle. I am not offering it for trade for a mule and cart, for sale to the first bidder, nor for sale at all.

My wife says that for a genuine joy-ride she prefers our little 10 h.p. steamer to the finest 6 cylinder gasoline car she ever rode in. (She flatters me by saying that it is partly due to the superior skill of the driver.)

Now I have talked a lot, and probably said little, but want to say further that any of you fellows who want to put some time and study into mastering the details of your car for the sake of driving a car which is smooth running, easy riding, powerful, and has almost perfect control, will not be disappointed in a Stanley. (I speak of the Stanley not to advertise it, but because my steam experience has been almost entirely with that car.)

I expect to enjoy the new-born Steam Department in your magazine, and will from time to time relate my experiences and ask some questions.

Steamer Queries.

From W. B. P., Vermont.—It was with pleasure that I noted in the Steam Car Department of the last issue letters from old-time correspondents of the Steam Motor Journal, viz.: Mr. Sherman and Mr. Wight, and I certainly hope they will come again.

I am going to ask one or two questions more if I may, hoping Mr. Wight or some other Stanley car user will answer it for me. Is there any way a Stanley engine, as used in their 1906 and 1907 cars, can be hooked up so as to use steam expansively? You know a locomotive is always hooked up as soon as they get under way; now a Stanley engine is a perfect counterpart of a locomotive engine on a small scale. Could not a little quadrant and lever be put in place of the present foot pedal or connected to it, with say, two or three notches in the forward motion half of the sector or quadrant, a center or cut-out notch and an extreme back notch?

Won't some old engineer or steam car man come forward and tell what the results of such a scheme would be? As I understand it, we use live steam the full length of the stroke now, or nearly so, am I not right? Would it likely be an expensive change?

Has a Second Hand One.

From W. B. P., Vermont.—Some time ago I noted that one of your correspondents advised against purchasing a second hand steam car. Now I wish to try to prove that there are exceptions to that rule the same as all others. In October, 1908, I purchased a second hand Stanley car. It had been used by a doctor nearly one and one-half years and I have run it myself a good many hundred miles since and the same tires are on it now that were on it then. Three of them have never been off at all since I owned the car and the fourth was taken off last fall for a puncture, my first and only tire trouble, and they are apparently good for two or three years more. I have had one breakdown, caused wholly by an incompetent garage man, and all other troubles or inconveniences which I have had have been caused altogether by my own ignorance or folly, and I cannot see why the car does not run as well now as a new one could. I have kept a close record of everything I have paid out and

I find it costs me less per year than it would to keep a team.

Backfiring on a Steamer.

From J. Harris Wight, Massachusetts.—Maybe I can give Mr. Charles A. Conro of Wisconsin a little light on his backfiring, as I have had lots of experience in this line on fixing up old steamers.

He states this is caused only on long hard pulls like up long grades. Well, his trouble no doubt comes from the thermo or fire regulator which does not close soon enough and his generator becomes red hot. So when the thermo does close down the pressure is off. The gas coming from the feed nozzle, the red hot generator will light this gas and follow back to the nozzle. If he will simply lower his thermo needle about $\frac{1}{4}$ or $\frac{1}{8}$ inch his trouble no doubt will end. I find that this has to be done on my car about once in 300 or 500 miles, as no doubt the heat affects the thermo rod so it does not fully expand. This is my experience with a White steamer and I can overcome it every time this way it has happened to me. My generator never gets hot only in such a case, and I am on the lookout for it and catch it the first thing. Heating the generator will soon make some of the coils open up or burn out.

Backfiring comes sometimes from the pilot having leaks around it or openings in the burner somewhere, but if his runs hot no doubt the above is the full cause of it. If he will try this I would like to know the result.

The thermostat should not hang on more than two minutes, if it does you will get a hot generator. Any time you find it staying on more than a minute and a half better slow the car just a little and let the fire close out. Then run on. This is caused by much water coming into the generator, and not changing the temperature quick enough. This is my experience with my car.

When a man once understands his White steamer he can't find its equal and it will give him the best return on his cash of any car made. It is a very simple car to understand and run and very satisfactory. It has no equal for road work smooth and speedy, and mighty quick in actions. No dragging around up grade with a White steamer. On the model O car the flow motor has a needle valve. This valve must be just 3-32 of an inch from its seat. If out of place it will let too much gasoline pass and cause a hot generator. The flow motor in this case had better be sent to the company for adjustment, which I understand is made free.

Will Some One Tell Him?

From W. B. P., Vermont.—I have two questions I should be pleased to have answered, either through your journal or otherwise, as you think best. I have an '07 Stanley, Model EX, and at times I am much annoyed by a sharp or shrill whistling sound while running with main fire on; if I turn off the fire, it stops. I find that the colder the air, the louder is the whistling. This whistling seems to be in the burner. Is it there or where? What is its cause and how can I remedy it?

Can you give me any suggestions that will help me to adjust my fire automatic after having it apart for cleaning and regrinding? I can get the steam pressure part all right, but the trouble is to get the fuel valve part so the needle will just seat when the steam pressure reaches the proper point, that is seat closely, but yet not tight enough to spring the needle shaft or rod.

The Stanley Pressure Tanks.

From H. S. F., Georgia.—I own a model X Stanley Steamer of the date of 1907 that I have driven for the last four years. On the whole I will say that it has done splendidly, costing me very little for repairs and always taking me wherever I wanted to go. There is one thing however that adds to the labor of taking care of the machine that I would like to be told the cause of as well as how to correct. This trouble is the frequency with which the gasoline and air proportions in the pressure tanks have to be adjusted. The symptoms are these: I fill these tanks strictly according to the maker's directions by pumping about twelve pounds of gasoline pressure in the gasoline tank and then pump about ninety pounds of air pressure in the air tank with the hand pump. When I start off on the road the gasoline gains on the air to such an extent that after a drive of fifty or sixty miles both tanks will be so full of gasoline that there will not be room for a sufficient quantity of air; and the gasoline will have to be drawn off and the proportions of the air and gasoline readjusted. I however avoid this trouble on the road by attending to this adjustment before I start on a drive, but this as I have mentioned adds materially to the labor of taking care of the machine. The tanks seem to be perfectly tight, for when the pressure retaining valve is closed and the machine left standing the pressure on the fuel gauge will not fall the least even if it is left for weeks at a time, though if this valve is left open it falls quite rapidly. Will you kindly tell me how to correct this difficulty so that the machine will run farther without readjusting the fuel in the pressure tanks?

Reply.—We would suggest that you try this method: Leave the pressure retaining valve closed, and do what pumping is necessary to get up say 200 pounds of steam, by pumping air entirely, and not pumping any gasoline. If a large amount of hand pumping is required to get up steam, this would indicate that more air was needed in the pressure tanks. If but little hand pumping was required, it would indicate that but little if any air was needed. This method, therefore, will in a measure automatically keep about the right volume of air in the pressure tanks. The Stanley instruction book, pages 3' and 5, explain this matter.

The Locomobile Steamer.

From Louis Berg, Maryland.—I have been reading your magazine for several years and I would like you to give me some information relative to steam cars, as I have a small Locomobile, and wish to extend it longer and lower, as I am anxious to place the boiler in the front. Do you think it would condense the steam too much in this manner? And would you advise me to make this change, which is a 14-inch boiler and 4 h.p. engine? Would it give enough power to pull up hills? I also have trouble with my burner, as I cannot start with a pilot. Could I fix this burner as good as new and how?

(Note.—Possibly some reader familiar with the above steam car may be able to answer.—Editor.)

Mrs. Clark Fisher, of Trenton, N. J., has begun a book descriptive of her experiences while making an automobile tour of the world. One of Mrs. Fisher's reasons for writing such a book is to show motorists that the inconvenience and difficulties of a trip of this sort are very few.

Still motors run cheap.

OXY-ACETYLENE WELDING.

What May Be Done, How to Do It, and What the System Costs.

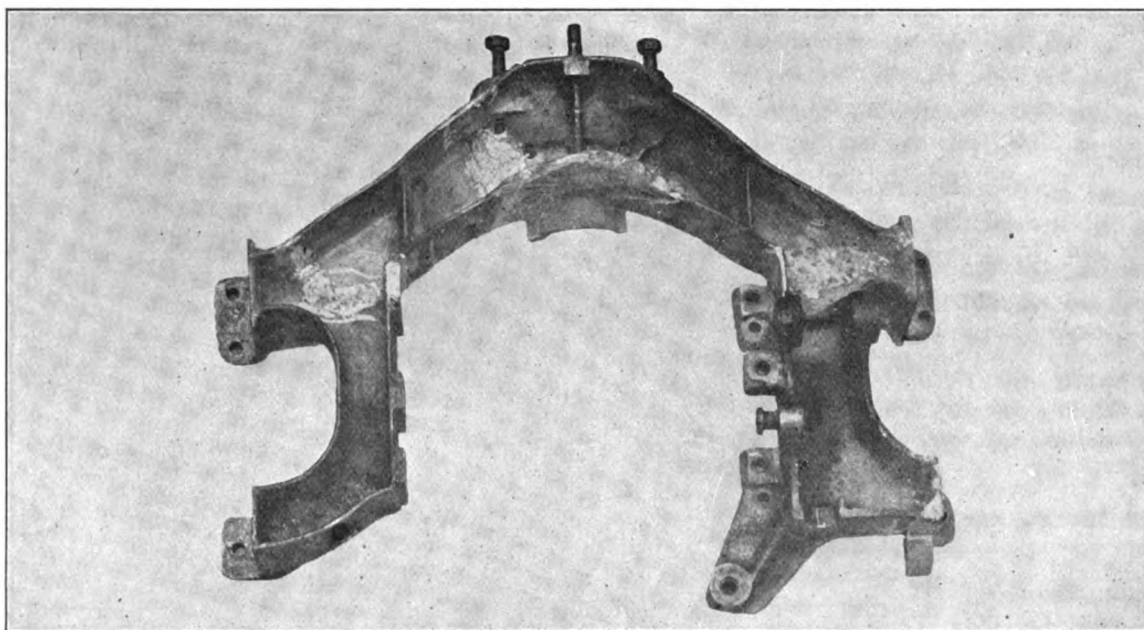
In view of requests for information which have been received the following account of the oxy-acetylene process of welding is presented.

Everybody knows that we can get heat by burning, or combustion. This requires oxygen. Without it, we have no burning. In fact, we shall be pretty scientific, if we say that combustion consists in uniting oxygen with something else. Now when we say "uniting," we do not mean merely mixing. There is oxygen in the air, but it is only mixed with the nitrogen; it is not united with it. Oxygen in water, however, is really united with the hydrogen. If we bring oxygen and hydrogen together in such a way as to produce water, we shall get a large amount of heat. But if

carbon and most of the oxygen. This produces more heat still.

The explosion and the union take place with extreme rapidity, and this is the reason why we get a great deal of heat in a small space. In fact, we get so much heat at the tip of the little flame that its temperature is thought to be about 6300 degrees F. This is a very high temperature, indeed, and much above the temperatures at which the metals are melted, which is very advantageous later on.

The tip of the little flame is the part with which the operator works. In making a weld, the first thing to be done is to prepare the edges which are to be united. These edges are not placed the one above the other. They are beveled off at an angle of 45 degrees, or thereabouts, and placed together on the same level. Then the workman proceeds to fill up this cut away space with new metal and to have the new and the old



Aluminum casting welded at points where bright patches appear.

we bring oxygen and nitrogen and only form the mixture, air, we are not to expect heat.

There is another way to get heat. When an explosive substance like nitroglycerin is detonated, we also get heat. Here what takes place is the opposite of uniting. The substances of which the nitroglycerin is composed separate from each other. It is, however, only certain substances with which this is the case.

In the oxy-acetylene blowpipe, we seem to have heat from both sources. A stream of oxygen and another of acetylene are brought together in a tube which forms the nozzle. The two gases are only a mixture as they flow out the nozzle. But the heat of the flame on the outside serves to explode the acetylene. This results in heat, just as when nitroglycerin is exploded. If you look at the flame of an oxy-acetylene torch, you will notice that it has a double flame—a tiny and bright inner flame and a rather large outer flame not at all brilliant. The explosion already mentioned takes place presumably altogether within the little flame. Here, too, its heat is generated. Three different gases flow along together, oxygen, hydrogen and carbon gas. The latter two come from the acetylene. At or near the tip of the little flame another thing probably takes place. This is the union of the

thoroughly united. First, he applies the torch to melt a little of the old metal near the bottom or lowest part. He starts the filling up process with this old metal. This is continued by melting in new metal from a rod just as one would do with sealing wax, and by softening the sides of the space to be filled. The melting and softening of the old material makes it possible to unite the new to it. The orifice is filled up to the top, or a little beyond. If the material is steel, it may be of advantage to use a hammer and tap all the highly heated metal as the work goes on. It will be seen that this process is quite different from the blacksmith's welding; it is more like soldering. One may unite two different kinds of metal, and almost any of the usual metals are responsive to the process. Brass, steel, copper, cast iron, aluminum—pretty much everything can be united.

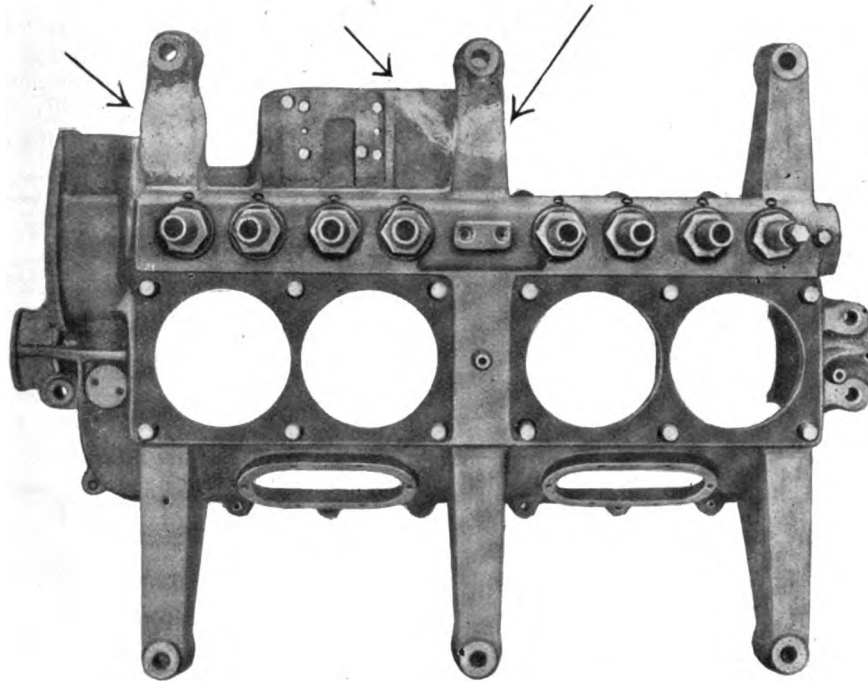
The possibility of uniting pieces of cast iron is especially striking. There is no difficulty at all. We use a rod of the same metal, ordinarily. Suppose, for example, that a cast iron part of a machine is broken. The part itself may be expensive. But very often, the loss of money involved in the delay of getting or casting a new one would be very considerable. With the oxy-acetylene process, the parts of the old casting

may ordinarily be united together on the spot and in a short time. Sometimes, the parts may be united without taking them from the machine. This new process is a wonderful money-saving device. Now, just as we deal with cast iron, so we may deal with cast steel. Further, it is ordinarily not necessary to heat the whole of the parts. The process deals with the locality of the break and the nearby portions. It is a local method. If the work is quite heavy, say over 2 inches thick, it will be advisable to preheat the neighborhood where the weld is to be made. This is often necessary. One of the reasons is quite plain. The little flame, excessively hot though it is, consists only of gases. So while the temperature is very high, the amount of heat is really not so great. A cubic

manner already described. It will be understood at once that the preservation of such a kettle from the scrap pile in so simple and inexpensive a way is a good service. A great deal of the lighter work may be done without pre-heating.

An example of a repair effected without dismantling is the case of an automobile truck. Here the frame had been broken close up to a sprocket wheel. In this situation, it was successfully dealt with without removal of the frame.

As before remarked, the oxy-acetylene process may be used to unite different metals. An example under this head may be cited from a system of manufacture of piping by a certain concern. The pipe itself is welded into form by this process, using a longitudi-



Aluminum casting welded at points indicated by the arrows.

foot of gas heated to 2000 degrees contains but a small amount of heat as compared with a cubic foot of metal heated to the same temperature. We can see from this that when we heat up steel or cast iron with the gaseous flame, the metal will absorb great quantities of heat in rising to high temperatures. Now we can aid the little flame by heating the metal in the neighborhood of the work to be done before we begin with the oxy-acetylene torch. This may be done with a charcoal fire, or otherwise, and will be found to lessen the expense of operating, even in those cases where the torch could be used alone. The high temperature of the torch is our means of furnishing a great amount of heat by means of a gaseous flame. Pre-heating still further assists. As an example of heavy work, we may cite a case which first occurred some time back. Some very large cast iron kettles, weighing about 18,000 pounds each, developed cracks in the exacting work to which they were put. Such cracks might be a couple of feet in length. The thickness was considerable. The kettle was turned upside down, and the crack cut away on both sides so as to form a V-shaped groove. At the bottom of this groove the two sides of the crack would be close together; at the top, they were several inches apart. A charcoal fire would be started underneath, and the metal heated, say, to redness. The work of uniting the two sides would then proceed pretty much in the

nal seam. The weld is a case of the union of two edges of the same material—rolled steel plate. The risers, however, which are to be attached are of cast steel—in effect, a different material. These are successfully welded on, and the pipe is capable of withstanding a test of 1000 pounds per square inch. Usually, the first test is successful. Another example is a case of uniting steel tubing and bronze. The differential gear box of the rear axle of an automobile and the tubing are united by this procedure. Automobile work probably furnishes as many examples of desirable situations for the use of parts composed of two metals as is the case with almost any other machine. Future automobiles may be expected to have more and more of such parts, so that he who would repair them must be fitted to do the work.

An example of what has hitherto been an expensive repair is a fracture in a locomotive fire-box sheet. By the use of the oxy-acetylene process, such breaks may be repaired without removal of the sheet. An interesting class of welding is where two lengths of pipe of the same size are joined end to end. The oxy-acetylene process is peculiarly suited to this and similar work, since a lap is not used. The work is done by butt welding. A weld of this character was made in the case of piping 5 feet in diameter. The thickness of wall was $\frac{1}{2}$ inch. Such piping is employed in certain industrial operations in such way that it is ro-

tated above a fire. Presumably from the result of expansion and contraction, cracks or faults arise. Formerly, such piping had to be scrapped; but now a section including the affected portion is cut out, and the ends of the good portions are welded together by the oxy-acetylene process.

From the fact that it is easy to melt sticks of metal by the use of the oxy-acetylene torch, it has come to pass that this device is much used as a "putting on" tool. For example, a knob or other projection has been broken off of a casting or other part. The location where the break occurred is gone over with the torch until it is well heated and softened. New metal is then added by melting it from a stick. This process of adding on can be continued indefinitely. In this way, a blank part can be built up. Afterwards, this blank can be cut to shape by the use of suitable tools. Stop and think what this means. A piece has been broken off of some part of an automobile. It may be that to replace the whole part would cause a vexatious delay or a considerable expense. An up-to-date repair man fitted with an acetylene torch can often step in and put on the piece needed, finishing it to shape after it has cooled off. Further, the piece added may be of an entirely different metal. A brass lug or projection may be added to an iron or steel part. Similarly, if it seems more advisable in the case in hand, the new piece may be fashioned to shape by any of the ordinary processes and then welded on. Thus, the new piece may be forged to shape, turned on a lathe, or even cast to shape. It can then be securely attached.

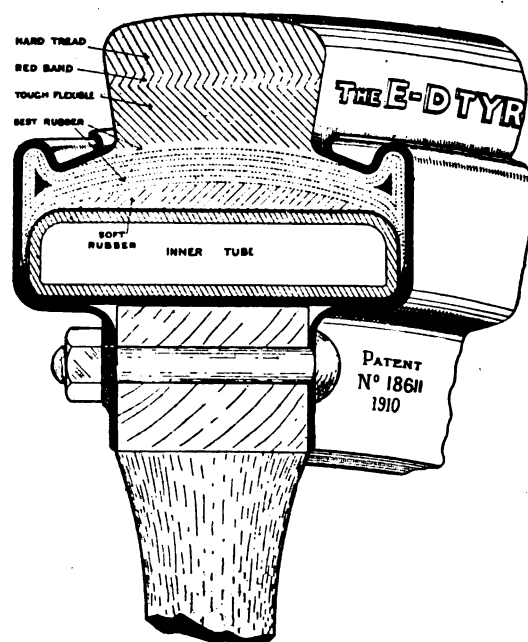
A fracture or a blow-hole or other cavity can be dealt with by melting in new material. Such a cavity or fracture may develop after a part has been in actual use, or if not so late as that, after a great deal of machining has been done. An example of this latter was an 1800-pound casting. It was an air cylinder, and it is said that \$300 worth of machine work had been done upon it when an internal cavity was discovered while a hole was being drilled. If this blow-hole could not have been dealt with effectively, much expense would have been in vain.

The foregoing account will open up the general subject and its possibilities. The cost of the entire outfit for this work is about \$375. Those who wish further information will do well to address the Davis-Bournonville Co., 88 West St., New York City. The torch used is a manageable instrument into which oxygen and acetylene are conducted by separate tubes. The acetylene under moderate pressure comes in from the generator where the gas is made. It passes through a packing of asbestos and mineral wool. It will be remembered that there was an old invention of Sir Humphrey Davy for the protection of miners when using a lamp in an explosive atmosphere. The flame was enveloped in a wire netting. So here with this packing: it is placed in between the reservoir of acetylene and the flame at the tip, and serves the purpose of preventing the flame from finding its way back. However, even if the flame should get through the packing, a very thorough device is arranged in connection with the generator. The acetylene just after leaving the generator passes through a water bath. Consequently, a flame coming back from the tip would have to pass through this same bath of water. Moreover, at the tip itself, an additional precaution is taken. The acetylene comes in through four holes arranged on the sides of the bore of the tip. Back of these four holes, the oxygen enters along the axis of the bore and under a higher pressure. The acetylene is thus driven on by the oxygen coming in from behind. The

interior of the tip from the points where the gases enter is a perfectly straight bore, so that the exit is an unimpeded one, so far as the instrument itself is concerned. The oxygen is supplied from a special portable tank. This gas may be bought in just this way. The acetylene can be readily manufactured as used. It is recommended that a non-portable generator be used in making acetylene. The cost of acetylene will be about 1 cent per cubic foot; of oxygen, about $2\frac{1}{2}$ cents.

A New Tire.

The illustration shows a sectional view of a new tire which has been patented in both this country and Europe, called the E. D. solid pneumatic tire. It is claimed for it that it will run easily 15,000 miles and that it is as smooth and easy of propulsion as the pneumatic tire. An examination of the section-view of the E. D. tire renders it evident that the air pressure forces the beads outwardly and locks them into their grooves. By the same means the upper part of



the band is held in close contact with the return parts of the flanges, allowing only the solid portion of the tread to bridge the space between, this being the only part of the tire called upon to sustain any air pressure. The function of the canvas arch, it is obvious, is to transmit all side strains directly to the beads, and thus securely to locate the solid tread centrally between the flanges.

As the tread meets with inequalities on the road, it is more or less depressed, flexing the canvas inwards and compressing the air in the inner tube in the manner of an ordinary pneumatic but with better effect. Although the solid tread moves freely between the flanges and is secured by them, no rubbing action of any sort takes place between either these, the tread, or the flexible band supporting it.

It has been found most unsatisfactory in light vehicles to attempt to run upon solid rubber tires. Neither passengers nor machinery can stand the vibration, and consequently, practically every motor-car and pleasure car throughout the country is to-day running upon the admittedly costly and troublesome pneumatic tire for want of an effective substitute.

The tire will shortly be introduced in this country.

THE PAINT SHOP.

How to Revarnish a Car and the Kind of Varnish to Use.

From M. C. Hillick, Pennsylvania.—There is nothing quite like varnish for restoring the frayed and faded surface of the car. Even the comparatively new car can be practically restored to its original self, so far as appearances are concerned, by the mere application of a coat of varnish. And now in these days of spring, is the best time to have the work attended to.

The first thing to consider in connection with varnishing the automobile is the varnish, its quality, adaptability, general purpose, features and so on. There are a multiplicity of varnishes, but the great majority of them are not suited to the exacting requirements of the motor car. For this vehicle, with its ample length and breadth, the varnish must be elastic to an unusual degree; it must have free, easy, and uniformly reliable working properties; it must, or at least should, dry free from dust in the length of a night; it should possess great tenacity of body, be comparatively free from mud spotting propensities and be capable of wearing durably under any and all circumstances. You will grant that such a combination of desirable, and, in fact, necessary qualities, are not easy to unite in any one material so that the choice and purchase of varnish resolves itself into a discriminating bit of business.

One word here to the buyer: Buy the varnish best suited to your trade and business regardless of price. The latter is secondary; quality, the prime consideration.

To the user: Use varnish intelligently and try to have it cared for on the car in like manner. Bear in mind always that varnish is the most sensitive and delicately balanced material entering into the composition of the automobile, chemical, mechanical, or what not. More, on the whole, is exacted of varnish than of any other one thing entering into the make-up of the car. In season and out of season, in rain and sunshine, mud or dust, general conditions good or ill, varnish is out on "the firing line," so to speak, doing its duty, and, in a sense, making or breaking the reputation of its manufacturer. Therefore the urgent need of using it with an eye single to the care and consideration belonging to it; of developing, in short, its resources for withstanding all the varied and cantankerous forms of service imposed upon it. This is a part—indeed, an important part—of the painter's business, and while it does not invariably benefit him directly, it does, nevertheless, in ways without number, assist to increase his influence and standing in the estimation of the automobile using public.

Practice of using varnish: The touch-up and varnish job is the one most in evidence during the spring run of work. This covers the car that comes to the shop with the old varnish coat in from fair to good condition. First clean the surface, body and chassis thoroughly. Rather a hard job this, but a main one. It is an axiom, "the car well cleaned is the car nearly finished." Anyhow, once get the work clean and fit to coat over and other things go easier. Look the surface over sharply for defects which, if deep or serious, had best be attended to at once. Touch up the spots with some lead and color. When dry putty such fractures. Then match a little color up with that on the body of the car, and touch over the putty or other spots, confining this touching up, however, to the precise size and outline of the spot or defect. Use

a match color containing enough varnish to prevent the color from drying flat. Have the color, in short, to dry with a gloss and thus retain its original tone and shade as matched to the field color. Do this after rubbing the surface with water and pumice stone flour.

About the mouldings—anywhere, as a matter of fact, that sediment or fine dirt particles are likely to lodge—run over with a swan quill pencil carrying white shellac. This will fasten the matter in place and prevent its distribution over the surface during the process of varnishing. After thus fixing this part of the work up wash very clean, taking care that all parts of the surface have been reduced uniformly during the rubbing with water and pumice stone flour, as above advised. Dust the surface very clean and thorough. Then with a medium heavy body, elastic finishing varnish, flood the body surface with a free, rich coat of the material. Then bring the chassis to a like good finish and trust to luck for the rest.

ONE BEST POINT.

What the Commercial and Truck Manufacturers Say of Their Own Cars.

Those who are contemplating the purchase or agency of commercial cars or trucks may be interested in the following condensed replies made to a query by the New York Commercial as to the "one best point in the product of well-known manufacturers of such vehicles:

The American Locomotive Company: Motor under the seat, with the following advantages: Less overall length, for a given length of loading space, shorter wheel-base, for a given length of loading space, less weight, greater facility in handling in congested traffic and narrow streets, less power required, lower cost of maintenance, in fuel, tires and bearings, less storage space required, less space required at loading platforms, less space required in street, whether vehicle is moving or standing.

Metzger Motor Car Co: The one great point of value to users of Hewitt trucks is their "durability," by which we mean very large bearings throughout, light reciprocating parts such as pistons and connecting rods, gears always in mesh, and absolute simplicity of operation—insuring practically constant service. We have had trucks on the market for over six years, and as far as we know they are all satisfactorily operated today, with the exception of two which were destroyed in a Boston garage fire.

Peerless Motor Car Co.: Weight in proportion to load. Distribution of truck weight between front and rear axles. Over 80 per cent. of the load is carried by the driving wheels. Low center of gravity. Large wheels and large diameter tires. Engine long stroke and moderate speed. Simplicity of control. Bearings and all wearing parts extremely large in size with very liberal factor of safety.

Rapid Motor Vehicle Co.: One great point is the fact that every part of our 1911 motor truck is enclosed, all working parts being properly encased.

Commercial Truck Co. of America: Ample strength and capable workmanship; most approved type, modern design by which gearing is all encased and runs in oil. Motors, gears, driving shafts, and in fact, the complete driving units in unalterable relation to each other, which means that no parts receive strains they are not designed to carry.

Abresh-Cramer Auto Truck Co.: We have succeeded in combining in the design of our trucks the same strength as others have with less weight. One

very essential feature in our trucks is the designing of the so-called radius rods, which terminate the power of the rear wheels to the frame of the machine.

Franklin Automobile Co.: The one best point in Franklin commercial cars is the air-cooled motor. Air cooling is the ideal system for any vehicle propelled by an internal combustion motor but its desirability is manifested nowhere so strongly as in the commercial car.

The Lansden Co.: You ask for the "one best point." My answer is—the greatest number of days per year in service, not for one year or two, but continuously, incidentally at the lowest figure per mile.

Autocar Co.: The utility of a commercial vehicle is its chief feature. This embodies economy in operation as well as durability. The products of this company are designed to meet the individual needs of various trades, and special designs are available to fit the circumstances of traffic to be encountered.

Seitz Automobile and Transmission Co.—The one best point of value to users of Seitz trucks is the double friction transmission system. This is a double friction transmission. There is nothing else on the market today like it. There are other frictions, of course, but this is entirely different as far as comparison with any other friction is concerned. The Seitz is twice as effective as any other.

The Baker Motor-Vehicle Co.: Aside from the superiority in workmanship and construction and the combination of simplicity of efficiency which we do not believe is obtainable elsewhere in any similar line we might state that in our product we have reduced friction to a point considerably below that attained by any other manufacturer of electric vehicles.

Mack Bros. Motor Car Co.: The one best point of value in "Mack" trucks is the "Mack" patented transmission. The only Selective Clutch Transmission with gears always in mesh, the most critical point of motor service. Used exclusively on "Mack" trucks and cars.

THE PROSPECTIVE BUYER.

Good Advice About Selecting and Running An Automobile.

From M. T. Minogue, M. E., in *The Gas Engine*.—A hesitancy of this exists in the mind of a prospective purchaser of an automobile, who may live in small towns and rural districts, for fear that if he purchased a machine he would be handicapped to make or get the proper assistance for making repairs and adjustments, as they occur, and instead of his machine being a profit and a pleasure to him it would be a source of trouble, annoyance and expense. Let me point out to such a person that no longer need he fear such a condition to arise. The American made machine today is built along the lines of practicability; having, by thorough trials and experiments, eliminated all the undesirable parts, weak points, etc., and bringing all the parts to a minimum of simplicity, in order to avoid as much as possible the occurrence of even minor troubles. When a man who never owned or operated an automobile, is thinking of making a purchase of one, he will visit the nearest local agent or write to the various factories for catalogues of their different types and models. He will receive a volume of literature, which tells him of magnetos, spark coils, carburetors, multiple point spark plugs, selective, progressive, planetary and friction transmissions, storage and dry cell batteries, single and dual systems of ignition, differentials, axles, floating and semi-floating of

clinchers, tires, quick detachable and demountable rims, mufflers, muffler cutouts, internal and external band breaks, mechanical oilers and splash oiling systems, irreversible steering wheels, etc.

When he reads this and a great deal more of a similar nature, he is ready to retire and dream a terrible "nightmare" of the complication of the automobile and the thousand and one things that would happen to him, all of which he would imagine that he had little knowledge about and that it is a vehicle only intended for a "Westinghouse" mechanical expert or an "Edison" electrician to operate. Let us diagnose the case and from the existing facts, turn this "nightmare" into a truthful and beautiful dream. Every machine, no matter of what character or duty it has to perform, must necessarily have the different parts named; these parts named come into ordinary use and become as familiar to the owner or operator of a machine as the different parts of the human system, viz., the hands, feet, ears, nose, etc. It should be borne in mind that the manufacturers of automobiles are more assemblers of various parts, adapted to their design of car, than a manufacturer of all parts that go into the construction of their car, and thus the manufacturer of the accessories (as they are called) are manufactured by various independent concerns and are sold to the manufacturer of automobiles. By this method the automobile accessory manufacturer is a specialist in his particular line, and as competition is great, the product thus furnished is the very best, and often on a low-priced car there will be found the best and highest priced accessories. The manufacture of the various parts that go into the construction of an automobile by various independent concerns has been the means of bringing the automobile to a stage of perfection, and reducing to a minimum the troubles of operating and maintaining a car. The different machines used in the rural districts, are in many cases more complicated than the automobile. The steam traction engine, for instance, is far more dangerous, complicated and requires more skill and care than any automobile, either of a low or high-power machine, and the average young farmer operates the same without difficulty.

To operate and properly care for an automobile, it is only necessary to use a little common sense and ordinary judgment, just the same as you would use in any ordinary piece of machinery in every day use; or in other words, to use the same judgment you would in taking care of your horse. You need to know the necessary instructions that are given for the proper care of your machine when you make the purchase; you will receive from the agent a book of instructions, which explains very plainly how to take care of and operate the car purchased. You must eliminate from your mind that the automobile in general use is a complicated, mysterious thing, that is only understood by an expert. My advice and instructions for to operate an automobile consist of six things, viz., have gasoline in your tank, water in your radiator, the proper amount of oil in your lubricating system, a good current from generator, battery or magneto, (the latter is simply a small dynamo), plenty of air in the tires and last but not least, a little good judgment and you can go anywhere without any serious trouble, delay or mishap. There are certain little things that you will learn gradually as you continue to operate the machine: these little things are considered minor affairs, but they are necessary to be known to get the best results out of a machine, and save expense and repair bills. A few things, of which I will refer to, the

operator, by paying attention to same, will soon find it a pleasure to learn and will venture to say that in a short time of running he will soon know more about his own particular car than the best expert from the factory that built it.

It is not necessary for one wishing to operate and take proper care of a car to go into the technical parts of it, unless he wishes to become a designer and build a car of his own. If a part becomes broken or worn a new duplicate part can be obtained from the local agent or the factory and he can replace it in a very short time, and I dare say, make a far more perfect job than the innumerable graduates from automobile schools, which are numerous in large cities, into whose hands place a screw-driver and monkey-wrench and a machine will suffer from their six weeks absorbed education of technical knowledge. When work of this character is to be done and if you don't wish or feel competent to do the work yourself, consult your local agent and allow it to be done under his supervision and you can depend on its being done well, as it is to his interest to have your machine always in perfect order. He will instruct you where and how to find trouble, if it exists, and will show you how to adjust your carburetor, how to locate a foul plug, how to adjust your vibrators, etc. These little things, when once learned from a practical man, become your lasting knowledge and I can assure you that you will take pleasure in knowing and doing these things. The man that gets the real pleasure and service out of a machine is the man that runs and cares for it himself and the knowledge that he gets from time to time forms a very pleasant and interesting conversation to his friends and acquaintances.

If you are not at all familiar with an automobile when you make your first purchase, rely upon your local agent, as you see him from time to time, and it will not be long until you will know as much as he does about your car, by imparting his knowledge to you. After you have operated your machine for a time you will no doubt learn little things that he does not know, which come up quite frequently in running of a machine. You can't learn to dance unless you get on the floor and you can't learn the little things that may occur to a machine until you care for and operate it. If you should learn a new side step don't forget to explain it to your old dancing master (agent), and other automobile neighbors, and I can assure you that your motoring will be very successful and a pleasure.

This has been the case with hundreds of motorists the country over.

How to Apply Tire Chains.

In selecting a chain, see that there is a uniform twist in the cross chains so that they will lie perfectly flat on the tire. The links should have a fine, smooth well, perfectly polished and hardened. Such a chain can and should be applied with the same side out until the cross-chains are worn about one-third through; then it should be turned and worn out completely on the other side. This practice requires very little care, but it doubles the life of a chain, which may be prolonged further if the cross-chains are replaced just before they are worn through. New cross-chains should be selected with the same care as the original grips.

Don't drive in car tracks. The sharp edges of the rails cut the rubber covering allowing water to decay the fabric.

Spark Plug Troubles.

From E. W. Longnecker.—When trouble resulting or arising from the spark plug is under consideration many things should be kept in mind. First, the plugs connection with the cylinder or ignition chamber through a post in the cylinder walls; that the inner end of the plug is on the interior of the cylinder walls and exposed to all the vicissitudes found there, such as the extremes of temperature, to the lubricating oil and to the carbon deposits caused by excessive fuel. On the other hand, the outer end of the spark plug which is on the outside of the cylinder is exposed to metallic mechanisms which may be in close proximity to mud, water and external variation in temperature, all of which may in a measure if not directly carry off the current intended for the terminals on the inner end of the plug.

It will be seen therefore that it is not always necessary to remove the plug at the first suspicion of trouble in connection with it. External investigation will sometimes reveal the cause of the trouble which results in misfires or a succession of them. As an illustration of this fact we recall an instance of misfire where current, coil, vibrator, and all responded admirably to the various tests, and yet the engine would persist in misfiring.

The plug was frequently removed and its terminals and internal insulation carefully cleaned and examined and tested. Each test indicated a live energetic spark at each buzz of the vibrator, but upon putting the plug back into place and starting the motor the misfire began. It was not until the plug was exposed to view while the engine was running that the cause of the trouble became apparent.

The spark plug was located just below a water plug in the jacket which had a slight leak and allowed a drop of water onto the insulation of the outer end of the plug. This caused a short circuit and the spark to jump from the metal binding post on the end of the plug across the insulation to the metal of the cylinder wall into which the plug was screwed.

It is apparent therefore that it is quite as important to keep the outer end of the plug clean and free from water, dampness, or metal fixtures, as it is to keep the inner end of it and its mountings in good condition.

Carbon deposits on the insulation and terminals, whether from burned lubricating oil or from the dry carbon resulting from overfeeding of gasoline, will cause the spark plug to become clogged or shorted on the inner end, so that short circuits will deflect the current and prevent what would otherwise be a liberal and effective spark.

A rough insulation will coat over more readily with carbon than a smooth surface and consequently the porcelain insulation with its smooth glossy surface is favored by many motorists in preference to the unpolished insulations.

The terminal points should be from 1-32 to 1-16 of an inch apart according to conditions. A current may be strong enough to send a fine spark across a 1-16 inch gap out in the open atmosphere, but would fail of jumping a 1-32 inch gap in the condensed charge within the compression chamber. As a rule if the current is of sufficient strength to serve its purpose well it will be strong enough to jump a 3/8 inch gap in the open air.

When starting from a standstill don't attempt to make a flying getaway and ruin your gears, differentials and tires.

The Hagstrom Spark Plug.

The accompanying cut, which is certainly very attractive, is used to illustrate the Hagstrom Spark Plug. This plug has a porcelain guard which is such an excellent feature that the manufacturers would like to explain it to our readers. It will pay our subscribers to

and the makers of many novelties now using rubber-cloths will do well to look into "Ruboilin" material. "Ruboilin" is made up at present into workers' and washers' aprons. These "Ruboilin" aprons are proving popular to carry in a car for slip-on when a little work on an engine or a tire becomes necessary



Clever Illustration of the Hagstrom Plug made by Hagstrom Bros. Mfg. Co., Inc., Lindsborg, Kan.

write for full information to the Hagstrom Bros. Manufacturing Company, Inc., Lindsborg, Kansas.

The Craft Steam Inner Tube Vulcanizer.—We illustrate in our advertising columns for the first time this month The Craft Steam Inner Tube Vulcanizer. The manufacturers say it will vulcanize two tubes every 15 minutes, without danger of burning, repairing any break, up to the length of 11 inches, in one cure. It is also stated that this machine will do all the tube work in any garage in the United States. The device is fitted to use with gas or gasoline and it will be sold to any of our readers for \$25, cash with order. This vulcanizer is not sold through any retailer or jobber in the United States, but only on direct mail orders. Address your inquiries or orders to the Combination Steam Vulcanizer Company, 304 East 48th street, Minneapolis, Minn., and in writing mention this magazine.

A New Material on the Market.—Rubber-surfaced fabrics have been used in the automobile trade in countless ways and since the very first use of the motor-car. Rubber is more immediately and startlingly affected by gasoline, and almost as readily by greases and oils, than almost anything possible to use around a car. A new material has just been announced to the trade, to replace rubbered cloths, in "Ruboilin," manufactured under a secret process by The Ruboilin Company, with offices at 253 Broadway, New York. "Ruboilin" looks like rubber-cloth, but contains no rubber, it costs less, wears better where subjected to wear, is fully waterproof, and is not affected by either gasoline, oil or grease. Top-makers and upholsterers

struction is high class in every respect. The engine is air-cooled, with shaft drive. The car is equipped with three-inch tires, Schebler carburetor and Atwater-Kent Unisparker. The car has a pressed steel frame with 80-inch wheel base. Send your inquiries to the Demot-car Company, Detroit, Mich., not forgetting to mention this magazine.

Fore-Door Tire and Demountable Rim Holders.

These are specially adapted for "Fore-Door" and "Torpedo Cars," which afford no opportunity for attachment of tire holders to the body. These rim holders consist of a heavy floor plate which is attached to the running board. Extending upward from this are two vertical telescoping arms connected by a cross telescoping arm, thus affording adjustment horizontally and vertically to accommodate one or two large or small tires. The finish is highly polished brass and these holders are equipped with either three strong straps or two straps and a chain for the base. They are manufactured by the Garage Equipment Company of Milwaukee, Wis.

Eyeshields for the Motorist.

Every automobile owner should possess a pair of goggles to keep the wind and dust out of his eyes when motoring. The accompanying illustration shows a pair of goggles which have become quite popular with the motorist who is called out in all kinds of weather, and sells for only \$1.00, sent direct from the factory. These are called the Rex-4-Way goggles. They are made with a



The Rex 4-Way Goggles.

on the road. The makers offer samples to the trade at \$1.00 in heavy, durable drill back, or 75 cents in lighter apron for less constant use; the regular retail price is \$1.50 and \$1.25 respectively. Dealers should communicate with the manufacturers for trade prices in dozen or gross lots, not forgetting to mention this publication.

A Car That Is Always Ready To Go.—This is the phrase which is used by the manufacturers in describing the 1911 "Demot." Speed, style and comfort are combined in this neat little car and the remarkable part about it is that the car as shown this month in our advertising columns may be purchased for only \$500. This small amount buys the car complete and full equipped with top, curtains, slip cover, gas lamps, generator, oil lamps, horn, brass automatic wind shield and speedometer. The con-

frame of leather which is extra large, containing front eye pieces, which protrude, allowing the glass to project well away from the eyes. As can be seen from the illustration, the glasses are open at each side, the opening being protected by screens made of nickel-plated wire, admitting air and at the same time enabling the driver to see to either side. The price is \$1.00. They also have them as low as 25 cents. These goggles are made by The Texas Company, 205 Kinzie street, Chicago, Ill.

Special Request

IN writing to advertisers for circulars or information, you are earnestly requested to mention in each case that the advertisement was seen in the "Automobile Dealer and Repairer." By so doing you will confer a favor on both publisher and advertiser

Bolt and Screw Cases.—Every manufacturer, dealer or repairer of automobiles knows the importance of keeping parts and tools in an accessible place, where anything that is wanted may be readily found. One of the most convenient devices for the automobile trade is the bolt and screw case, manufactured by the American Bolt & Screw Case Company of Dayton, Ohio. This case is illustrated in our advertising department on another page. It occupies but a small space and its capacity is very large. Each drawer is locked in the case, which prevents the mixing of the contents of the drawers. This case is made in various sizes and styles. Write to the manufacturers, as above, for catalogue and price-list and mention this magazine.

Electric Head Lights.—A new announcement appears this month from Hammer & Hull, 1839 Euclid avenue, Cleveland, Ohio. These people manufacture electric head lights, especially adapted for model "T" Ford cars. They say these lights can easily be fitted to any Ford car at small cost, and readers are requested to correspond with them on this subject, not forgetting to mention this magazine.

Fibre for the Trade.—Vulcanized fibre in sheets, rods, tubes and special shapes for automobile work is manufactured by H. M. Grant, 6 Murray street, New York City, and he would be glad to correspond with any of our readers, who are interested in this material. Write for estimates and mention this paper.

"Perfect" Vehicle Washer.—is said by the manufacturers, Perfect Manufacturing Company, Saratoga Springs, N. Y., to save labor, water and hose and to be a necessity in every stable and garage. Write for catalogue and mention The Automobile Dealer and Repairer.

Auto Tops.—The Wisconsin Auto Top Company of Racine, Wis., makes a specialty of auto tops. They say their very large production enables them to give great value for the money. Send for their catalogue and money saving prices, mentioning this paper.

Special Proposition.—The Smethport Rubber Company of Smethport, Pa., has a special proposition to make to jobbers, dealers and tire repair people everywhere. Write at once and find out about it. It may be to your advantage.

Racine Tires.—These tires, the manufacturers say in their announcement are guaranteed against punctures, and blow-outs and to run for 3,500 miles. They say further that the average mileage is far in excess of this. They want to send their catalogue giving further particulars about these tires to every reader of The Automobile Dealer and Repairer who may be interested. Write at once to the Racine Tire Company, Racine, Wis., mentioning this paper and the catalogue will be promptly forwarded.

"Stay Shiny."—This is the catchy and expressive name for a metal polish manufactured by F. H. Schmoeger, of Sterling, Ill. In his advertisement in the classified columns, Mr. Schmoeger states that it is a marvelous tarnish preventive, and will make the brass parts of an automobile look like gold plate all the time. It saves a lot of hard dirty work, time and money. The cost of this polish is only \$2.00 for a pint can with brush, express prepaid to any automobile owner in the United States. Good agents are wanted. In sending your orders or other correspondence to Mr. Schmoeger, please mention The Automobile Dealer and Repairer.

The K. W. Ignition Specialties.—We have just received the new catalogue No. 16 issued by the K. W. Ignition Company, 37 Power avenue, Cleveland, Ohio. This company manufactures a very large line of ignition products, including high tension magnetos, low tension magnetos, spark coils, Master vibrators and road lighting outfits. They would like to put this catalogue in the hands of every automobile owner, dealer and repairman in the United States; and it will be sent free to any reader of this paper, who will take the trouble to write for it and mention this magazine.

Polarine for Motor Cars.—In this issue will be found a new announcement from the Standard Oil Company, of their celebrated Polarine Oil, which they claim affords perfect lubrication in tropical or zero weather. The motorist, they say, with this oil is entirely independent of changes in temperature. Readers of The Automobile Dealer and Repairer are requested to send to the Standard Oil Company, for their free booklet entitled "Polarine Pointers." This booklet not only gives valuable hints on lubrication, but it also tells the causes of all kinds of engine troubles. Send to the nearest agency of the Standard Oil Company or direct to the office at New York City, and in writing mention this paper.

Back to Broadway.—That "just a step" is too far from Broadway for an automobile salesroom has been clearly demonstrated by the Times Square Automobile Company now at 731-733 Seventh avenue. This company, extensive dealers in slightly used and rebuilt cars, has leased the premises 1706 to 1718 Broadway at 54th street, and will move in during the latter part of April. There is nothing like "The Great White Way" for the automobile business.

Good Dealers Wanted.—The Hudson Motor Car Company has a full page announcement in this issue, which should interest every automobile dealer in the United States. This car is well known, has been extensively advertised and its merits are generally recognized. An agency for the Hudson Motor Car Company is really a live proposition and we hope that dealers in unoccupied territory will promptly answer the advertisement. But read the announcement carefully and address your inquiries to the Hudson Motor Car Company, 6034 Jefferson avenue, Detroit, Mich., not forgetting to mention this magazine.

Garage Turntables.—The Lansing Wheelbarrow Company, 100 Cedar street, Lansing, Mich., with branches in various cities, manufactures an automobile turntable with which they say any woman or boy can turn the heaviest car. They direct the attention of our readers in their announcement on another page to the great danger of backing out of a garage. They want to send their booklet giving full particulars and prices to every reader who may be interested. A postal card will bring it.

The "Boreas" Wind Shield.—This is a new wind shield that is being marketed by E. K. Conover and W. W. Robinson, under the firm name of Conover & Robinson, with salesrooms at Motor Hall, 244 to 252 West 54th street, New York City. Conover & Robinson will act as sole distributors of this wind shield which is manufactured by the Page Woven Wire Fence Company of Adrian, Mich. Preparations are being completed for a large output. Some of the good points of the "Boreas" Wind Shield may be enumerated. They have a clean cut

appearance, and the charm of novelty in method of construction. They are made in two styles of several sizes, folding and ventilating. Both types take either the vertical or zig-zag positions and fold all the way down front or back, and both are entirely automatic. Mr. Conover the inventor of this shield has created a long list of valuable accessories in the automobile trade, including the Conover car, the Raisewell Lifting Device, which is made under license by the Lovell-McConnell Manufacturing Company; also the Conover Exclusive Bumper, under license to the New Jersey Tube Company, and the Universal Top Cable Reel under license to the Emil Grossman Company. Mr. Robinson, who is associated with Mr. Conover, has been connected with the automobile industry almost from its infancy, having built electric cars as early as 1895 and subsequently designed Woods Electric and Friedman Gasoline automobiles. He was one of the pioneer supply men in the West, and has been closely identified with the supply, magneto and engineering business since that time. Mr. Robinson and Mr. Conover are joint inventors in several other automobile accessories, which will soon be placed on the market, among which are a new hose clamp, an automobile wheel and a novel foot pump. Address all inquiries regarding rates to Conover & Robinson as above, and mention this magazine.

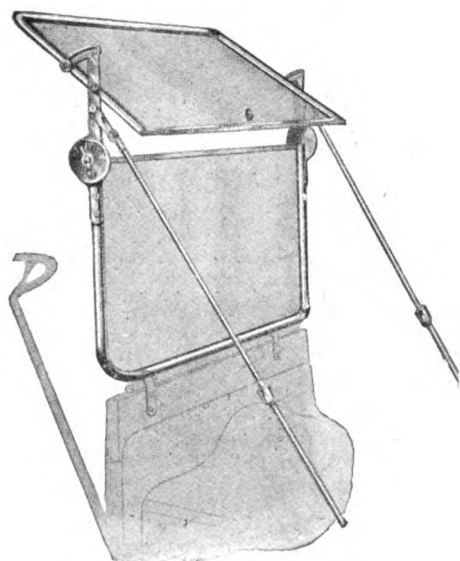
A Reliable Ignition System.—F. R. Parker Company, 243 Columbus avenue, Boston, Mass., has a special word to say to Ford and Maxwell car owners with respect to the Atwater Kent Unispartaker. But consult their full page announcement on another page and write to them for further particulars.

What Autolac Will Do.—Many car owners hesitate to have their cars refinished on account of the expense and loss of service involved. Autolac eliminates these objections as it can be applied quickly and dries in from five to twelve hours depending upon weather conditions. It gives a smooth, hard and durable surface with a brilliant luster. It will not discolor from mud or water the manufacturers say. It can be applied either with a soft brush or with a piece of clean cheesecloth. Anybody can do it. The manufacturers have so much confidence in their preparation that they offer in their circular to return the money if it is not satisfactory. Write at once for descriptive circular and prices to the Autolac Manufacturing Company, 916 Huron Road, Cleveland, Ohio.

The Hunky-Dory Blow-Out Patch.—This is a new tire patch which is fully described in an interesting page announcement in this issue by the Walker Auto Tire Band Company of Indianapolis, Ind. The manufacturers say that this patch saves the expense of vulcanizing, and when it is on, you have the positive knowledge that it is going to hold. This patch is a double section cut from the latest improved sectional protector, made by the same company, and of course the Walker Tire Protectors are too well known to need any description at this time. The price of the Hunky-Dory Blow-Out Patch is only \$1.75, postage prepaid, and no doubt many of our readers will wish to send for one or more of these patches. In sending in your orders, address the Walker Auto Tire Band Company, Indianapolis, Ind., and do not forget to mention this magazine.

The Vasco Wind Shield.

Every reader of The Automobile Dealer and Repairer should carefully read the rather sensational two-page announcement which appears in this issue from the Victor Auto Supply Manufacturing Company, 35 West 43d street, New York City. These people are making a direct mail order campaign on their celebrated Vasco Wind Shield, and the prices at which these shields are offered, considering their merit, are very low. The plan of the Victor people is to eliminate the jobber and the middle man to a certain extent and to sell these shields direct from the manufacturer to the consumer. They are anxious also to make a very attractive proposition to every dealer, garage owner and repairman in the United States. The Vasco Wind Shield is made in various styles and in this shield the manufacturers say they have embodied every essential that is necessary for a perfect wind shield, and in addition many exclusive features which cannot be found in any other wind shield. Some of the points about this shield, are as follows: Automatic one hand control, six different positions,



Vasco Wind Shield.

simplicity of design, elegance of finish, positive locking automatic friction disk, folds over hood when desired, clear line of vision, can be locked up at any angle, no intricate mechanism, cannot break, rattle or work loose. Readers should consult the advertisement and send their orders direct to the Victor Auto Supply Company. A beautifully illustrated catalogue will be mailed free, if you mention The Automobile Dealer and Repairer.

The Mac-Kae Universal Terminal.

In the advertisement of the Mac-Kae Manufacturing Company, in this issue will be found illustrated and briefly described the Mac-Kae Universal Terminal which will positively fit every style of plug on the market, foreign or domestic. Readers who have never tried this terminal, should send for a sample. The same manufacturers are also putting on the market the Mac-Kae Spark Plug, which is made in all sizes with porcelain or mica cores and is guaranteed for one year by the makers. The price of this plug is \$1.00 and the manufacturers claim that it will give a maximum power, positive ignition and minimum fuel con-

sumption. But our readers are urged to correspond with the Mac-Kae Manufacturing Company, 185 Amory street, Jamaica Plain, Boston, Mass., and in writing do not forget to mention this magazine.

Star-Clean.—Emerson, the noted philosopher, has said, "If a man makes a better book, preaches a better sermon, or makes a better mouse-trap than his neighbor, though he build his house in the woods, the world will make a beaten track to his door." This quotation has been applied by the manufacturers of an article for the automobile trade bearing the unique title of "Star-Clean," and the quotation is undoubtedly an apt one; as an enormous sale has been built up for this article without any advertising. Star-Clean is simply invaluable in the garage. It will thoroughly clean the surface of an automobile, but without the slightest injury, and the cleaning is done instantly. It is just as good for the leather cushions and tops and there is no other preparation which has this combination, so that it can be used on the upholstery, the top or the body. It will also clean the brass fixtures that are connected with the wood, and the most wonderful thing about it, is its instantaneous operation. This article is being marketed at present by B. M. Asch, 1779 Broadway, New York City, and in this issue he makes a special offer to our readers. A 4-oz. bottle will be mailed postpaid on receipt of 30 cents if you will mention this publication. This is a sufficient amount to completely polish a large limousine body. For garage use a 20-oz. bottle will be mailed for \$1.00. This offer is merely made for introductory purposes, and, as it may be withdrawn at any time, we advise our readers to take advantage of it at once. The Western Agents for Star-Clean are Wm. P. Miller Co., 2316 So. Wabash avenue, Chicago, Ill. In all your correspondence either with Mr. Asch or the western agents, do not fail to mention this magazine.

Livingston Radiators.—The Livingston Radiator and Manufacturing Company, 136-146 West 52d street, New York City, repairs all types of radiators. If there is anything the matter with your radiator write to them.

The Inter-State Car.—Readers who are looking for a high grade medium priced automobile should not fail to carefully read the attractive announcement which appears in this issue from the Inter-State Automobile Company of Muncie, Ind. They advertise a very interesting line of cars, including five passenger touring cars, roadsters of various types, four passenger demi-tonneau, four passenger torpedo, five passenger touring torpedo, and seven passenger touring torpedo, ranging in prices from \$1,750 to \$2,700. Readers are urged to send to this company for their beautifully illustrated catalogue, which will be sent free to any reader of this publication and readers are requested to use the coupon, which is attached to the advertisement of the company.

New Branch Opened.—The Colby Motor Car Company of Mason City, Iowa, have opened a Selling Branch in the city of Minneapolis, Minn., which is rendered necessary by the increasing demand for their cars in the North-Western territory.

Michener's Chain Carbon Remover.—All of our readers are no doubt aware that the efficiency of a car is very seriously interfered with by an accumulation of carbon in the engine cylinders.

One of the best remedies for this condition is the clever device manufactured by E. S. Michener, 800 Washington street, New Castle, Pa. It is known as Michener's Chain Carbon Remover. It is a flexible coil chain made of unusually tough soft wire, and the method of using is to force it through the spark plug hole, inject a little kerosene and the engine is then run for a few minutes, and the remover actually cleans out all the carbon from the pistons, top and sides of the cylinders. Readers are urged to look over the very attractive announcement of this device, which appears in our advertising columns, and correspond with the manufacturer at the address given above; and in writing do not forget to mention this magazine.

Big Profit in Vulcanizers.—The Haywood Tire & Equipment Company call attention this month in our advertising columns to the large profits repairmen are often able to make by the use of a good vulcanizer. They claim that the Marvel Haywood Vulcanizer will enable the repairman to make 40 per cent. profit on every dollar invested. Model "H" is the most suitable type of these vulcanizers for the garage repairman's plant, and it enables him to do all tire repair work, retreading, sectional tubes, etc., without the expense of a large boiler and the loss of floor-space. Send for catalogue and further particulars to the Haywood Tire & Equipment Company, 528 No. Capitol avenue, Indianapolis, Ind.

A Free Sample of Metal Polish.—The Crown Manufacturing Company of Indianapolis, Ind., manufacture Bailey's Metal Polish, a thick oil cream polish, which they say leaves no sediment or powder and produces a lasting lustre. They guarantee satisfaction or will refund the money. They want to send a sample of this polish to every owner of an automobile who is a reader of this paper. Turn to their advertisement, cut out the coupon attached to it and mail it to them with your name and address distinctly written and a sample of the polish will be promptly forwarded. They also have a special proposition to make to dealers and will send samples for examination.

Remy Magneto.—Not many of our readers will be likely to overlook the full-page announcement in this issue of the Remy Electric Company of Anderson, Ind., with general offices in several of the large cities. The Remy Magneto is the evolution of years of successful manufacturing. It is guaranteed to be reliable and to give satisfaction. The manufacturers would like to correspond with every reader who may be interested and will cheerfully furnish full particulars and explain all the good points of their magneto.

Arnold Alarm.—This device is adapted for motor-boats as well as for automobiles and it is said to have the right tone, quality and volume of sound to instantly attract attention. Can be heard for great distances on country roads and above the roar of city traffic. The Standard Electric Company, Department "S," Racine, Wis., wants to arrange with dealers everywhere to sell it. Write to them for special terms and full particulars.

Automobile Seats.—The La Porte Carriage Company of La Porte, Ind., make a seat which can be attached to any runabout and provide more room. See their announcement on another page and write to them for prices and further particulars.

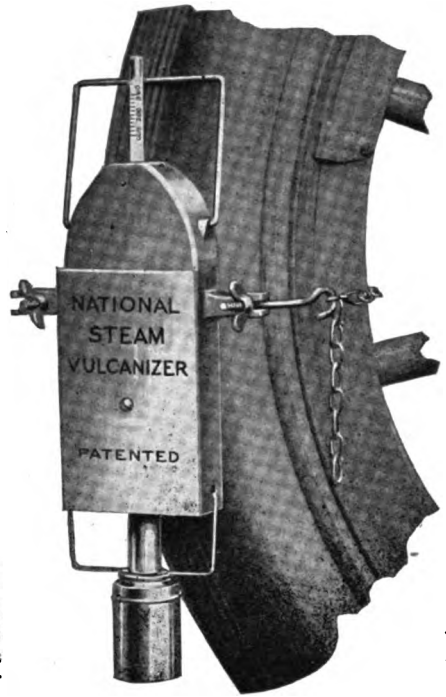


Vulcanizing an Inner Tube

STEAM!

That's the Reason Why
ANYONE can use a

"NATIONAL" STEAM VULCANIZER



Vulcanizing a Casing

without any previous experience whatever, and run absolutely no risk of burning his tires. When you get up steam, which takes about nine minutes, simply adjust your alcohol lamp and it will maintain a steady, even temperature without further watching. Any tire manufacturer will tell you that STEAM is the ONLY method of doing FIRST-CLASS vulcanizing. That's why we have hundreds of customers who have used electric and other DRY-HEATED vulcanizers and have burned their tires. They are now using "NATIONALS," with perfect satisfaction. (Read the first testimonial letter below.) You can use a "NATIONAL" Steam Vulcanizer in the country or anywhere. Pack it in your tool box and take it along. Why bother with the dope that "fills up the cuts," but comes out in a few days? Vulcanize your casings and tubes with a "NATIONAL," and then forget them, as there is no patch there to come off. The new rubber is part of the tire. You can make one casing outwear three by keeping the small holes repaired

SPECIAL OFFER: We don't ask one cent in advance. You send us your name and BANK reference, and we will ship you a vulcanizer, including all supplies and instructions by express. Try it ten days on your own tires and if it is just what you want and have been looking for, send us \$12.00 or return the vulcanizer to us. We could never make such an offer if we did not KNOW that the "National" was the best vulcanizer on the market. You take no chance, as you have not one cent invested. Better order to-day.

DON'T TAKE OUR WORD FOR IT. READ WHAT USERS SAY.

I shipped you to-day a ——— Vulcanizer, which you can have as a relic. I have repaired a five inch slit in a tube and also casings, and find the National Steam Vulcanizer does not burn the rubber like the other vulcanizer did. Your vulcanizer can be easily regulated while with the ——— I had to watch it constantly. Another good point I notice about the "National," that pleases me is that it only requires about half the time to do the job as with the one I am sending you.
(Signed) N. H. ADSIT, M. D.,
Succasunna, N. J.

We are pleased to advise that our factory reports they are receiving very excellent services from the Vulcanizers ordered of you. You undoubtedly have the best portable Vulcanizer we have ever seen, and we think the "National" is O. K.
(Signed) THE GARFORD CO., Elyria, O.
(Mfrs. of the Studebaker-Garford Cars.)

I consider the "National" Steam Vulcanizer simply perfect. I have repaired large cuts in casings so they are just as good as new. It is a "cinch" to vulcanize inner tubes with it.
(Signed) H. L. TOWER, Norwich, Conn.

We have used the vulcanizer on several tires of our big fire trucks, and will say that it has given perfect satisfaction.
(Signed) FIRE DEPARTMENT,
City of Alliance, Ohio.

We have given the "National" vulcanizers ordered of you the most thorough and severe tests, and have yet to report a single failure. It is not only simple and practicable, but the best vulcanizer we have ever seen.
(Signed) Y. M. C. A. AUTO SCHOOL,
Boston, Mass.

Your vulcanizer received, and find it to be a dandy. Repaired a split in a tube 14 inches long in three applications. Also repaired a lot of casing cuts and find the work perfect.
(Signed) B. F. HEMPEN, Alexandria, La.

I have given your vulcanizer several tests and find that I can easily repair all my cuts and punctures. It works fine.
(Signed) Dr. H. P. GREAVES,
Waterproof, La.

I have repaired several bad cuts and run the tires through all kinds of roads with no effect on repaired parts. The work already done would pay for the vulcanizer.
(Signed) DR. O. M. VAUGHAN,
Covert, Mich.

The "National" vulcanizer is giving very good satisfaction.
(Signed) H. D. ROE, Claremont, Cal.

Your vulcanizer certainly does the work, and I am more than pleased with it. Am going to tell my friends to order one.
(Signed) DR. CLYDE C. MACK,
Quincy, Fla.

Your vulcanizer received, and I am more than pleased with it. It certainly works perfectly and I have more than saved its cost already.
(Signed) B. L. ARNOLD, Edmeston, N. Y.

We find your vulcanizer does excellent work.
(Signed) MANUFACTURERS SUPPLY CO.,
Philadelphia, Pa.

I want to sell some of your vulcanizers to my friends, as it will do just as you claim for it.
(Signed) H. B. SELL, Winchester, Va.

Your "National" Steam Vulcanizer works like a charm, and I am very much pleased with it.
(Signed) H. C. MORRISON, Norwalk, O.

I am delighted with this vulcanizer, and it has proven more than satisfactory. Would not be without it.
(Signed) FIRST NATIONAL BANK,
Canton, Miss.

We find your Steam Vulcanizer entirely satisfactory.
(Signed) ALPINE AUTO CO.,
Alpine, Texas.

The "National" Vulcanizer is all you claim for it and is O. K.
(Signed) F. H. DECKER, Lestershire, N. Y.

I vulcanized a sand blister 2 x 5 inches and did a perfect job. The little machine is certainly a great money saver for any auto owner, and every one would have one if they knew how convenient it is.
(Signed) E. S. WERTZ MILLING CO.,
Reading, Pa.

Your vulcanizer works fine.
(Signed) W. H. DEUEL, Arnold, Wis.

The National Steam Vulcanizer purchased from you some time ago has been used steadily ever since, and has given perfect satisfaction. There is no question but what this is far ahead of any electric vulcanizer, as the STEAM heat cures the rubber much better than DRY heat possibly could.
(Signed) CARNEGIE AVE. AUTO CO.,
Cleveland, O.

The Vulcanizer is a dandy, and I am very well pleased with it.
(Signed) DR. W. E. SHOOK, Shubert, Neb.

The Vulcanizer works fine.
(Signed) PIONEER AUTOMOBILE GARAGE CO., Kenton, Okla.

We find that we can do work that would do justice to any professional vulcanizing plant. Repair bills, worry and trouble are certainly eliminated with the "National," and we would not think of being without one, since we found how good it is.
(Signed) READY MFG. CO., Troy, N. Y.

I vulcanized a place on my casing 3 1/2 x 2 1/4 inches, where the rubber was torn all off down to the fabric. When I took the vulcanizer off it was the prettiest job I ever saw. Twenty-five dollars would not buy my "National" if I could not get another.
(Signed) HENRY W. TRUE, Phillips, Me.

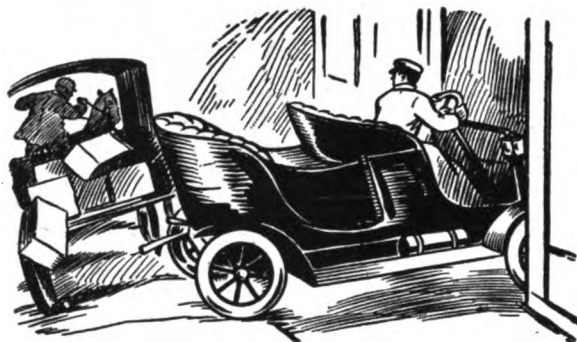
We have hundreds of references like these from every corner of the United States and a number of foreign countries.

Manufactured by THE NATIONAL MOTOR SUPPLY CO., 1910 Euclid Ave., CLEVELAND, O.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

DON'T BACK OUT OF YOUR GARAGE!

USE A
TURNTABLE



TAKE NO
CHANCES

LANSING AUTOMOBILE TURNTABLE — IS JUST WHAT YOU WANT —

Saves you time and prevents accidents.

Upon reaching the Garage you drive in, turn car around on turntable, and then you are ready to drive out—**NOT BACK OUT.**

“Drive right in, turn around and drive right out again.”

Any woman or boy can turn the heaviest car on a LANSING AUTOMOBILE TURNTABLE. Use the table as a washstand.

There is a manhole in the turntable which permits chauffeur to get beneath the car to adjust or examine the machinery. All steel construction, lasts a lifetime—any mechanic can install this turntable.

Regular size 12 feet 6 inches in diameter, but we build any desired size. Can be installed outside of building and used all winter.

We build tables that do not require a pit, can be installed on wood or concrete floor if already laid, without any tearing up.

WRITE FOR BOOKLET—it tells all about turntables—a postal will bring it.

LANSING WHEELBARROW CO., 100 Cedar Street, Lansing, Mich.

NEW YORK

PHILADELPHIA

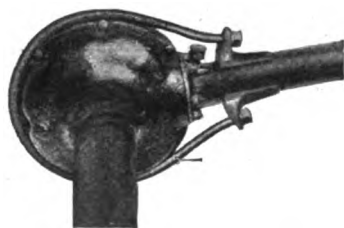
CHICAGO

KANSAS CITY

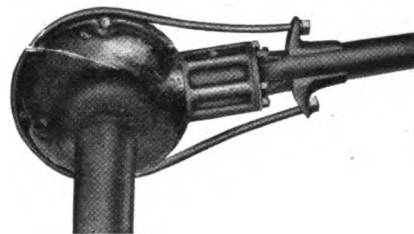
MINNEAPOLIS

SAN FRANCISCO

THE GARDNER TRUSS FOR FORD “T” REAR AXLE.



Placed on Car in 3 minutes.
Order Short Truss for cars equipped with
Babbitt Bearing.



Placed on Car in 3 minutes. Keeps the Two Joints Solid.
Order Long Truss for cars equipped with
Roller Bearing.

This device will hold the three parts of rear axle and shaft tube as solid as if made of single piece of steel, and will prevent the rocking and chattering of rear axle when starting and stopping car. It will also prevent the leaking of grease from these parts, insuring perfect lubrication to differential pinions and bearings.

A groove in the loop straddles the thin edges of the differential housing, sealing it solid. **7**

PRICE, \$3.00 F. O. B. CHICAGO. [LIBERAL DISCOUNT TO DEALERS.]

THE GARDNER AUXILIARY ENGINE BASE FOR FORD “T” CARS.

It costs \$15.00 to \$20.00 to make the average crank case repair in the Model “T” Ford engine, and this expense must be repeated each time an adjustment is made, piston rings installed, push rods replaced, etc., and the expense during the season becomes excessive, not to speak of the annoyance.

THE GARDNER AUXILIARY ENGINE BASE was designed to save the Model “T” owner this great expense.

The old method requires that the engine be removed from car to make the slightest repair in the crank case, this taking from one to two day’s time, whereas with the Gardner Auxiliary Engine Base installed on car, access to the parts in the crank case is accomplished in a few minutes.

GARDNER ENGINE STARTER CO., Chicago, Ill.

Gentlemen:—The truss and base sent me, received and have been put on my car. The truss makes the car run 50% easier. The base fits perfectly and does not leak. Besides has already paid for itself three times, for had to put in a new crank bearing. With the base the job was done in a little over an hour with a cost of \$1.00. Otherwise would have been between \$30 and \$40. Am enclosing check for which send me another truss for short bearing like one sent me. Any one wanting to know anything about the two above equipments, give them my address and I will take pleasure in writing them.

Yours very truly,

(Signed) Dr. F. B. HENDERSON, 331 Washington Avenue, Greenville, Miss.

Shipping weight of Gardner Auxiliary Engine Base, 6 lbs. **PRICE, \$15.00 F. O. B. CHICAGO.**

WRITE FOR LIST OF TESTIMONIALS.

GARDNER ENGINE STARTER CO., 1451-1453-1455 Michigan Ave., Chicago, Ill.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

BALL MULTI-SPARK PLUGS



Give a **hotter spark** than any other plug made and therefore explode a **thinner mixture** of gas. Therefore **more power** and **less carbon**.

Bear these points in mind and insist upon no other in your motor equipment.

Sold by good dealers everywhere.

Price, \$1.50.

Booklet and descriptive matter for the asking.

"The Plug with a Guarantee."

THE BALL MULTI-SPARK PLUG CO.,
917 HENNEPIN AVE., MINNEAPOLIS, MINN.



Our New Non-Inflammable

Will polish if metal is wet.
Will not settle. It's quick.
It will not leave a white deposit or sediment.

It will not burn or explode.
It will polish hot metals.

Write for Free Sample
MANUFACTURED BY

The Harvey Chemical Co.
Dept. D,
Lafayette, Ind.

On slippery roads and pavements, a tire which is losing traction suffers severe abrasion—much more damaging than the slight friction of the chain.

Always declutch when turning corners and passing over rocks.

All cuts and large punctures should be vulcanized or filled with some rubber compound.

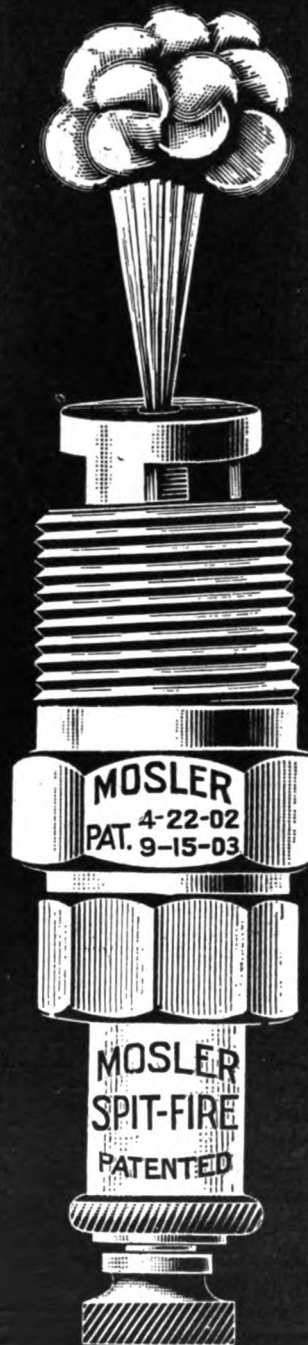
If the car is to stand for any length of time in the garage, place it on blocks or jacks.

Explosions in the muffler are very often caused by missing, the unexploded charge finding its way into the muffler, there to be exploded by the next exhaust flame coming that way.

Mosler Spit Fire

THE PLUG WITH
THE DEEPEST CHAMBER

Made to fit any Engine any Thread



Magneto Type-Battery Type-Breach-Block Type The plug with the handle

A. R. MOSLER & Co.
163 W 29TH ST. NEW YORK.

Just What I Want



MOHAWK TIRES

BELIEVING the time is opportune for the manufacture and sale of a first class Tire at a price that makes the tire cost of an automobile within reason, we are manufacturing the "Mohawk" to meet this demand.

Our selling list printed here is like our tires, something to be proud of.

Really, what does the mileage guarantee amount to?

Of course, all "Mohawk Tires" are of good quality and are so guaranteed to give mileage within reason, but why not "Be your own Insurance Company."

Consumer's List

	Casings	Tubes
28x3.....	\$11.50	\$3.00
30x3.....	12.40	3.30
32x3.....	14.00	3.55
30x3½.....	17.25	4.45
32x3½.....	18.50	4.70
34x3½.....	20.00	5.00
36x3½.....	22.00	5.25
30x4.....	24.00	5.75
32x4.....	26.50	6.00
33x4.....	27.45	6.25
34x4.....	28.30	6.50
36x4.....	30.20	6.80
34x4½.....	35.00	7.75
36x4½.....	38.00	8.25
36x5.....	42.00	9.00

Living Propositions to Live Dealers

Special Introductory Prices to Consumers.

MOHAWK TIRE CO.

Dept. A

210 Genesee St.

Utica, N. Y.

TIRE BARGAINS!!

We are offering A LARGE STOCK!

TIRES AND TUBES!!

All Fresh, Live New Goods which we secured way below cost by advancing cash.

An Unusual Opportunity for a Real Saving!!

TIRES

Size	Price	Size	Price	Size	Price
28x3.....	\$9.75	30x4.....	\$15.00	34x4.....	\$17.75
30x3.....	10.25	31x4.....	15.75	36x4.....	18.50
30x3½.....	12.50	32x4.....	16.00	34x4½.....	22.50
32x3½.....	14.00	33x4.....	16.75	36x4½.....	23.75

RE-COVERED SHOES

that have been re-covered in our shops which are the largest in New York.

28x3.....	\$7.00	36x3½.....	\$10.50	34x4.....	\$12.00
30x3.....	7.50	30x4.....	10.50	36x4.....	12.50
30x3½.....	9.75	31x4.....	10.75	34x4½.....	12.75
32x3½.....	10.00	32x4.....	11.00	36x4½.....	13.50
34x3½.....	10.25	33x4.....	11.50		

Prices on Dunlops quoted on request.

INNER TUBES

Diamond, Hartford, Continental Seconds, etc.

28x3.....	\$2.80	34x3½.....	\$4.35	34x4.....	\$4.75
30x3.....	3.15	36x3½.....	6.00	34x4½.....	5.90
30x3½.....	4.00	30x4.....	5.80	32x4½.....	3.75
32x3½.....	4.25	32x4.....	4.80		

Slightly used tubes at less than one-half price while they last.

28x3.....	\$2.00	30x4.....	\$3.75	34x4½.....	\$4.25
30x3.....	2.10	31x4.....	3.85	36x4½.....	4.50
30x3½.....	3.25	32x4.....	3.95	36x5.....	4.75
32x3½.....	3.35	33x4.....	4.00	920x120.....	4.85
34x3½.....	3.50	34x4.....	4.10	935x135.....	5.00

TIMES SQUARE AUTO. CO.

731-733 7th Ave., near 49th St., (After MAY 1st, 54th St. & Broadway)

—ALSO—

Philadelphia: 238-40 N. Broad St. St. Louis: cor. Pine & 18th St.
Chicago: 1832-4 Michigan Ave. Kansas City: 18-20-22 Grand Ave.
Dallas: 1815-17 Commerce St.

Tire Chain Fastenings.

Since the successful operation of grip chains, as well as the life of the tires on which they are used, depends on the freedom of the chains to creep around the wheel, they must not be fastened to the spokes or around the felloe, nor should a broken cross-chain be tied to a spoke; take it off at once and replace it at the first opportunity. To make assurance doubly sure, every car should carry an extra chain.

Sand blisters are a prolific source of disaster to tire treads. If not attended to at once these foreign substances are almost sure to finally penetrate to the fabric. These cuts should be washed out soon as noticed. If not too large they may be filled with tire cement. When too large or of too long standing the cuts should be vulcanized.

New York sells annually \$60,000,000 worth of cars, or about 33,000 machines. That's something to sell. Between Forty-seventh and Seventy-sixth streets on Broadway alone are sixty-one agencies or branch houses handling ninety-five different makes of American cars. The average pay of the help is \$2,000 a year each.

A pneumatic tire becomes hot, when driven for any length of time, the heat being sufficient in many cases to create a vulcanization between the inner tube and the inside ply of casing. Such a condition will boost tire bills at an alarming rate. To guard against it, use soapstone liberally.

It requires little learning to be the tooter of a horn.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

To the Automobiling Public

We are using this page to announce to the automobiling public the success of our latest motor lubricant under the name of

Polarine

Under the Brand POLARINE, Oil, Grease and Transmission Lubricants are supplied. Each product is manufactured for the lubrication of the special parts of the car for which it is recommended.

We offer these lubricants to you with confidence and we venture to ask, in the interest of your own car, that you give them a trial.

Our experts have prepared these lubricants and have tested them not only in the laboratory, but also on the road. They have used these lubricants successfully on various makes of automobiles, under favorable and unfavorable temperature and mechanical conditions.

As you may have learned by personal experience, most cars are worn out long before their time, on account of improper lubrication. Hundreds of stoppages and breakdowns can be traced directly to the use of unsuitable lubricants. There is as much difference in lubricants as there is in cars or in roads.

Our experts, who stand at the head of their trade, have produced in POLARINE,

lubricants that will lengthen the life of all types of American and foreign cars.

By the use of POLARINE brand of lubricants you will

**Increase Your Speed,
Climb Hills More Easily,
Prevent Many Breakdowns,
Reduce Your Repair Bills,
Make Your Car Run Smoothly
and Greatly Lengthen its Life.**

Already thousands of automobilists have discovered the value of POLARINE lubricants. They are using these lubricants themselves and are recommending them to their friends.

All dealers sell POLARINE lubricants or can get them for you.

POLARINE Oil affords perfect lubrication in tropical or zero weather. It is delivered in sealed cans—1 gallon and 5 gallon sizes—or in barrels and half-barrels. Other Polarine lubricants in cans of convenient size.

During their long experience in making automobile lubricants, our experts discovered so many useful facts about the care of automobiles that they have prepared a booklet entitled "POLARINE POINTERS." This booklet not only gives valuable hints on lubrication, but it also tells the causes of all kinds of engine troubles.

You may have this booklet FREE if you are an automobile owner. Send to our nearest agency.

Standard Oil Company

(Incorporated)

Please mention the Automobile Dealer and Repairer when writing to advertisers.

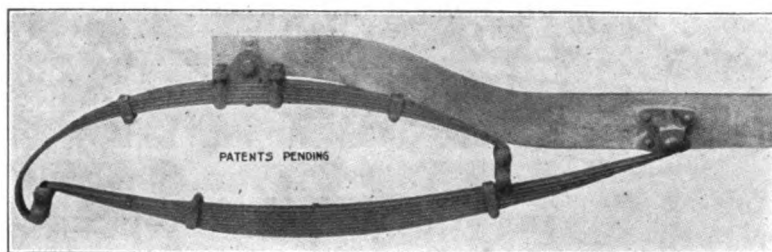
A New Automobile Spring.

The Garden City Spring Works of Chicago have just brought out a new spring "Radial Elliptic," shown herewith that presents some interesting features.

As the name implies it is a combination of the full elliptic, three-quarter elliptic and the half elliptic suspensions, having the pivot bracket of the former, the scroll top of the three-quarter and the radius rod construction or axle control of the half elliptic springs of general use.

By reducing the section of the top member only the desired resiliency is obtained according to the weight of the car equipped, reducing at the same time the vertical travel that would be required in other forms of spring suspension.

By resting the top member upon the lower midway between the axle and point of attachment to the frame is produced the same effect as a shock absorber, because the different moduli of vibration of the unequal members oppose each other; thus while jointly con-



New Radial Elliptic Spring made by Garden City Spring Works, Purple and 20th Sts., Chicago, Ill.

tributing their unrestrained resiliency, they exercise a quick dampening effect to the free vibration to such an extent that practically no throw is noticeable the body of the car.

They may be readily attached to any ycle of frame and any desired opening may be obtained by simply reversing the position of the saddle. The manufacturers are the Garden City Spring Works, Purple and 20th streets, Chicago, Ill.

The Schrader Universal Tire Pressure Gauge.—Every car owner should have a tire pressure gauge. All the tire manufacturers are laying great stress on the importance of having tires pumped to the proper pressure; as this makes easier riding and saves the tires. It is impossible to ascertain the exact pressure of a tire without a gauge and we can specially recommend the Tire Pressure Gauge made by A. Schrader's Son, Inc., 28-32 Rose street, New York City. It is an easy matter for any of our readers to get one of these gauges, as it is only necessary to send a one dollar bill in an envelope to these people and the gauge will be immediately delivered, postpaid. The accuracy of the gauge is absolutely guaranteed by the makers, and it is also in the most convenient form for use. In all correspondence regarding this gauge, readers should mention The Automobile Dealer and Repairer.

Removed to Philadelphia.—The Homo Company of America, formerly of Jersey City, have purchased a factory building at Philadelphia, Pa., where they will manufacture the Homo Carburetor and the Homo Carburetor Attachment. All correspondence should be addressed to The Homo Company of America, 3203-3206 Oxford street, Philadelphia, Pa.

World's Records for The Splitdorf Magneto.—Many of our readers are already familiar with the Splitdorf Magneto and their ignition apparatus, but it will be a revelation to some who read the full page announcement in this issue showing the sweeping victory which was won for the Splitdorf Magneto at the Jacksonville Beach Races. If any apparatus is successful under the exacting conditions of a race, it is bound to be trustworthy for ordinary road purposes. It will pay every reader who has not already investigated the Splitdorf Magneto, to write for their catalogue direct to C. F. Splitdorf, Walton avenue and 138th street, New York City, or to their nearest branch. In writing do not fail to mention this journal.

Rubber Putty.—This preparation is manufactured by the Toledo Auto Devices Company, 709 Gardner Building, Toledo, Ohio, and it is said by the manufacturers to be a true money saver and a protection to life and limb. It prevents blowouts, avoids sand blisters and saves fabric from decay. It can be applied in five minutes and does not soil

investigation. They can be used of course in both public and private garages. This company also manufactures a powerful hand lever pump. Write for their bulletin and mention this paper.

"Handy" Switches and Connectors.—The Chicago Electric Manufacturing Company, 530 Van Buren street, Chicago, Ill., manufactures "Handy" switches and connectors. Consult their advertisement in which you will find the various devices referred to illustrated, and send for their catalogue.

Welding by Oxy-Acetylene Process.—Many of our readers will be interested in the announcement of the Marietta Hollow-Ware & Enameling Company of Marietta, Pa. This company will weld all broken parts of automobiles whether of cast iron, steel, aluminum, brass or other materials, at moderate prices and promptly. All their work is guaranteed. Write to them for further particulars and mention The Automobile Dealer and Repairer.

The "Means" Cylinder Cut-Out Switch.—In an important announcement which appears this month in our advertising columns, it will be seen that the price of the Means Cylinder Cut-Out Switch has been reduced 33 1-3 per cent. This reduction is made to prove the value of the device and to introduce it quickly, and as the offer may only be a temporary one, our readers should take advantage of it promptly. This switch is a great convenience to any motorist, as by its use it is possible in an instant to locate the cylinder which is missing fire. Simply lift the arm of the switch and it locates the trouble. A set of six of these switches at the new price would only cost \$3.00, and a set for a four-cylinder car only \$2.00. The price for a single switch is 50 cents, or for a set of two \$1.00. Satisfaction is guaranteed or the money will be refunded after ten days' trial. Send your order to the H. S. M. Auto Switch Co., 1623 Master street, Philadelphia, Pa. With every set of switches a booklet is furnished, entitled "Troubles and Remedies." In writing to this company, mention The Automobile Dealer and Repairer.

Baldwin Chains and Sprockets.—A complete line of automobile chains, both riveted and detachable, is manufactured by the Baldwin Chain & Manufacturing Company, Worcester, Mass. They also manufacture all kinds of sprockets, including those for the following cars: Cadillac, Reo, Buick, Brush and Chase motor truck. Special sprockets are also made to order. Our readers are invited to send for quotations and circulars to the above company and in writing to them do not fail to mention this publication.

Wind Shield Glass at Special Prices.—Dealers will be very much interested in the announcement which appears in this issue from the Emil Grossman Company, 250 West 54th street, New York City. They are offering wind shield glass at bargain prices. The best imported polished French plate glass will be offered by this company in any desired sizes; and the price list published in the advertisement is certainly a remarkable one. It will pay every dealer to carry a few glasses in stock, as considerable profit may be made from their sale. As the advertisement may appear but once, our readers are urged to send their orders and inquiries immediately. In writing to this company, please mention The Automobile Dealer and Repairer.

the hands. It is claimed that it will save a car owner \$50 in a season. Send for their booklet giving full particulars.

The Cartercar Roadster.—On another page the Cartercar Company of Pontiac, Mich., illustrate and briefly describe their 30 h.p. Roadster costing \$1,150. They want to send a booklet containing full particulars to every reader who is thinking of purchasing a car. In writing for it please mention this paper.

Holtzer-Cabot Variable Speed Dynamo.—This dynamo is for automobiles and motor boats in connection with the new Edison storage battery. But consult the advertisement of the Holtzer-Cabot Electric Company of Brookline, Mass., on another page and send for their booklet No. 589, which will give you full particulars.

Never Miss Spark Plugs.—The Never Miss Spark Plug Company, Lansing, Mich., makes a new announcement in this issue which we presume will interest a great many readers. They say that their plug will not cause trouble of any sort and that it is guaranteed for a year, but consult their advertisement and send for their booklet. They have a special proposition to make to dealers.

Boilers for Stanley Steam Cars.—The Steam Carriage Boiler Company of Oswego, New York, announce in our advertising columns that they manufacture boilers for Stanley steam cars, as well as some others. Write to them for particulars, mentioning this paper.

Automatic Air Compressors.—The Globe Mfg. Company of Battle Creek, Mich., are manufacturers of Automatic Air Compressors, motor or line shaft drive for direct tire inflation or storage tank. These compressors have new and valuable features which are worthy of

FORD & MAXWELL OWNERS

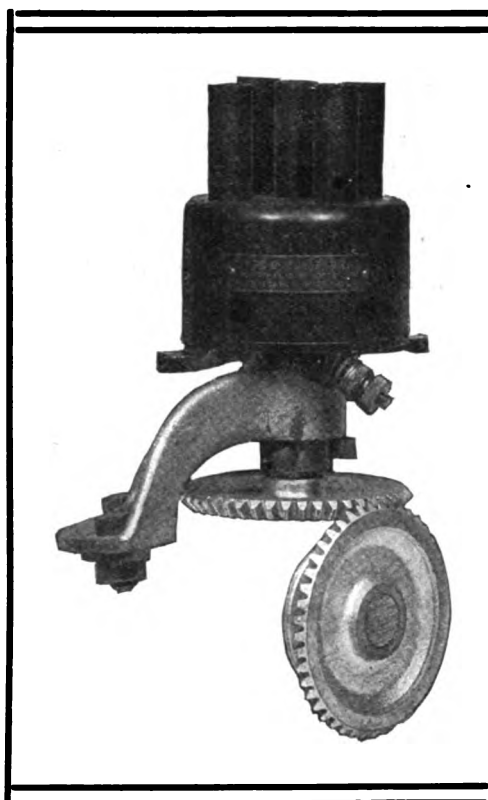
DO YOU WANT A RELIABLE IGNITION SYSTEM?

We manufacture brackets especially for your cars so that you may install the well known

Atwater Kent Unisparker

on your car and do away with all ignition troubles.

The whole outfit is shipped ready to install. No vibrators, no commutators and no weakly insulated coils to give trouble.



BRACKETS FOR OTHER CARS ALSO.

Write For Particulars

F. R. PARKER COMPANY

243 Columbus Avenue, Boston, Massachusetts

Mosler Specialties.

A. R. Mosler & Co., sole owners and patentees of the Spit-fire plug, have recently secured all the rights, title, interest and exclusive license in the Breech-Block Spark Plug. This Breech-Block Plug is also, by its construction, a spit-fire, inasmuch as it has the closed end and side cleaning holes, which are claimed to be one of the essential fea-

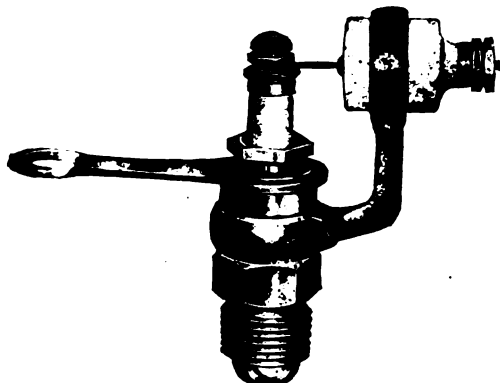


Fig. 1.

tures in plug construction where maximum efficiency and the greatest resisting power to soot, oil and water is obtained.

The side cleaning holes have the great advantage of allowing the gases which are compressed on the upstroke of the piston, to become heated before the spark occurs. Now, we all know that hot gas is easier to ignite than cold gas;

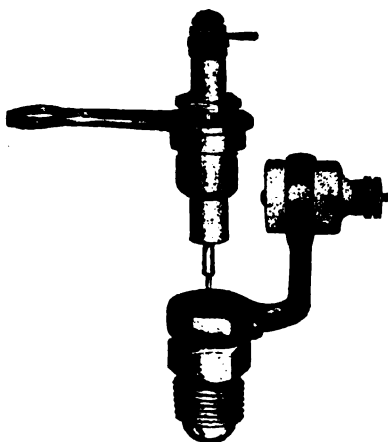


Fig. 2.

also that it is easier to start a motor after it has been running than when it is cold. A hot mixture is easier to explode than a cold one, consequently gases which are compressed in the inside of the plug, will ignite first, by the sparking and then "spit-fire" into the charge in the engine, thereby giving energetic ignition and greater power.

The Spit-fire construction when cou-



Fig. 3.

pled with a quick removable or separable insulator, changes instantaneously the sparking plug into a priming cup or relief cock, and permits simultaneously the quick inspection of the insulator in the plug and the priming of the engine. The limit in spark plug convenience is accomplished in the Breech-Block plug

where it is possible in an engine equipped with these plugs, to keep the engine running while you change a spark plug.

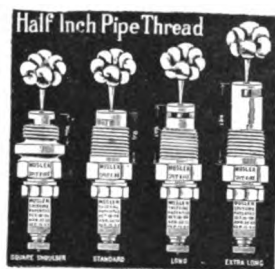
The accompanying cuts illustrate the device:

No. 1 shows the simplicity of the article, ready to insert in the engine.

No. 2 shows the entire unit picked out from the nipples without disturbing any connections with the entire surface of the end of the insulator, whether it be mica or porcelain, exposed for instant cleaning or inspection (should this be necessary), and this can be done without stopping the engine or a new plug can be instantly dropped back in its place.

No. 3 shows the top view of the assembled bracket and sparking point in position.

A. R. Mosler & Co., also offer a vertical and horizontal type carburetor; also the Mosler Ball Check Automatic, Mos-



ler Self-snap controlling levers and Mosler timers and distributors.

A very handsome booklet is distributed by the company, and will be sent out to any one who will write direct to A. R. Mosler & Co., 163 West Twenty-ninth street, New York City, N. Y. They are also distributing a sheet of useful hints for motor owners and operators, and are giving signs and counter mats to dealers and jobbers upon request.

In writing mention this publication.

Mohawk Tires.—The Mohawk Tire Company, Department A, 210 Genessee street, Utica, New York, comes before our readers this month with an announcement that will interest no doubt a great many. They say, "believing the time is opportune for the manufacture and sale of a first-class tire at a price that makes the tire cost of an automobile within reason, we are manufacturing the 'Mohawk' to meet this demand." They have a special proposition to make to every dealer or repairman and also a special proposition to make to car owners. Write them immediately and learn what it is. Consult their advertisement.

Wearwell Specialties.—Many of our readers will no doubt be interested in the full-page announcement in this issue of the Wearwell Rubber Company of Kokomo, Ind. They announce quite a number of specialties which our readers can use to advantage. But their advertisement tells the story better than we can tell it, so it should be carefully consulted by everybody. This company is making a special inducement to jobbers and retailers and is desirous to hear from every reader or repairman who is a reader of this journal. A catalogue will be promptly sent on application.

Repairing Lamps.—The American Car & Ship Hardware Manufacturing Company of New Castle, Pa., make a specialty of repairing lamps at reasonable

prices. See their advertisement in this issue. They invite correspondence from all our readers interested.

Shaler Vulcanizers.

The C. A. Shaler Company of Wau-pun, Wis., makes a complete line of vulcanizers for the public garage. Numerous detail improvements have been made on all the 1911 models, although the principle of operation remains the same as heretofore. Those illustrated operate from the regular electric light-



Type B.

ing circuit, consume but little current and are capable of making absolutely any kind of repairs to tubes or casings. Type B is for mending tubes (it will handle two at a time, and repair any puncture or tear) and also for sealing such casing cuts, etc., as have not destroyed the fabric of the tire to any great extent. These repairs are made with the tire on the wheel. The Type C Shaler Vulcanizer will repair any casing blow-out. The method of using it consists in strengthening the damaged portion of the tire by adding several layers of fabric on the inside and vulcanizing them in place under enormous pressure. At the same time, Type B is applied to the outside of the casing and fills up the



Type C.

cut in the tread. As the building up of the repair is all done from the inside, it is unnecessary to cut away good material from the tread as in a sectional repair. The result is a repair that is actually stronger than any other part of the tire. Type E is a tube plate that will handle six repairs at once or its entire length of twenty-four inches can be used on a single long cut or tear. The patent offset clamps furnished with this model operate quickly and easily and allow a



Type E.

completed repair to be removed without disturbing repairs that require a longer cure.

The C. A. Shaler Company also makes an alcohol heated vulcanizer for garages and motorists who do not have access to electric current. As in the electric models, the temperature is absolutely and automatically controlled by a thermostat so that there is no chance of burning or undercuring a tire, no matter how careless the operator may be.

HERE'S THE BEST BRAKE LINING



TRADE MARK
Raybestos

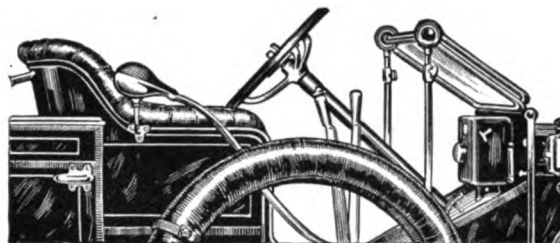
OF COURSE everyone uses **RAYBESTOS**. It is the most popular brake lining. It is used in preference to other linings because it gives the highest co-efficient of friction, because it is made of asbestos woven with copper wire. It is practically heat, water, oil and gasoline-proof.

If you want your brakes to work well, easily and quickly—line them with **RAYBESTOS**—do not accept a substitute.

Write us to-day for full information.

**THE ROYAL
EQUIPMENT
COMPANY**

450 Housatonic Avenue
Bridgeport, Conn.



Know an Auto from Hood to Tires

Expert knowledge of automobile construction is essential to car owners, repairmen, and drivers alike. To the owner it means certainty when judging a car, and a great saving in cost of up-keep. To the repairman, or driver, it means a greater demand for his services, a larger salary, and a permanency of position. To all it means knowing if a car is right, and when not right, exactly what to do and how to do it.

All this valuable knowledge is set forth in the Automobile Course of the International Correspondence Schools. The subjects covered are: Gasoline Automobiles, Gasoline Automobile Engines, Automobile Engine Auxiliaries, Automobile Carburetors, Electric Ignition, Transmission and Control Mechanism, Bearings and Lubrication, Automobile Tires, Automobile Operation, Troubles and Remedies, Overhauling and Repairs.

This Course has been prepared by recognized experts actually in the business. In other words it is practical as well as theoretical.

To learn all about it, and how you can most easily become an automobile expert, write today to

International Correspondence Schools
Box 1413, Scranton, Pa.



Tire Troubles Stopped

Wear the treads completely off, your tires without puncture, blow-out or rimcut by inserting the
DAYTON INNER TIRE

Inexpensive

Inserted and removed and placed in other tires by anyone.
Write for a descriptive price list to-day.

DAYTON INNER TIRE & MFG. CO., 19 Madison St., Dayton, Ohio



Every automobile owner should use it.

Write at once for special discount and full descriptive matter to the

AUTOLAC MFG. COMPANY, 916 HURON ROAD, CLEVELAND, OHIO.

Autolac is distributed by the following parties:

Frey Auto Supply Co., 700 Main Street, Buffalo, N. Y.
Polish Specialty Co., 83 Park Place, Detroit, Mich.

Every dealer or repairman should sell it.

Louisville Auto Supply Co., 648 S. 4th Street, Louisville, Ky.
John F. Revalk, 518 Van Ness Avenue, San Francisco, Cal.

AUTOLAC is easily applied by anyone.
AUTOLAC dries over night.
AUTOLAC is a smooth, brilliant finish.
AUTOLAC is durable. Will not discolor.
AUTOLAC needs no rubbing or polishing.
AUTOLAC makes your old cars look new.
AUTOLAC will make money for you.
AUTOLAC is sold under a guarantee.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Worn-Out Tires Made New

Your old tires which you are about to discard can be made like new at a low cost. Don't throw them away—don't have them vulcanized—don't buy new ones

Our Exclusive Process Makes Your Old Tires Puncture and Skid Proof

Hundreds of motorists are getting thousands of extra miles out of old tires which they formerly threw away. Our

TRIPLE TREAD PROCESS MAKES OLD TIRES LIKE NEW



Before
Treating

We use this old casing as a foundation upon which to build, covering it entirely with tough, wear-resisting, waterproof, French Chrome leather, giving you a tire that is like new, and one that will often run from two to three thousand miles further than this same new tire would run. This has been demonstrated time and again.

Where the greatest wear comes there are three thicknesses of this leather. The outer ply is brought down the sides of the casing far enough to give ample protection to the sides of the case against rut wear; the second ply is brought down the sides of the case over the bead, being skived (tapered down) at the edge so that it does not in the least interfere with replacing the tire on the rim. This gives added strength to the sides of the case and protects it at the point of contact with the rim so that rim-cutting is practically impossible. The third ply takes the place of the old rubber that is removed from the case before the Triple Tread is applied.

In addition to the steel studs on the tread, there are from one to three rows of flat-headed steel rivets extending down the sides of the case as far as the outer ply comes, which gives an additional protection to this part of the case against rut wear. The steel studs in the tread and the side rivets fasten the different plies of leather securely together.

The Triple Tread is put in place and made to fit perfectly over every square inch of surface, so that when the process is completed the Triple Tread is actually a part of the old casing, the plies of leather, rubber and fabric being inseparately united.

An old tire Triple Treaded is actually better than a new rubber tire for the following reasons:

It makes your tires absolutely PUNCTURE-PROOF.

It makes your tires as nearly SKID-PROOF as anything can possibly be made—doing away with the use of chains at all times for the reason that our studded tread affords more traction than chain.

It reduces the possibility of a blow-out to the minimum.

The Triple Treaded tire is as smooth and slightly in appearance as a new tire. It has none of the ragged edges or scalloped projections found on leather covers and detachable treads.

The Triple Tread, being actually made a part of the casing, cannot creep or become loosened and for this reason no more heat will develop than would be the case with an ordinary rubber tire.



After
Treating

Every Triple Tread is Guaranteed Perfect in Material and Workmanship

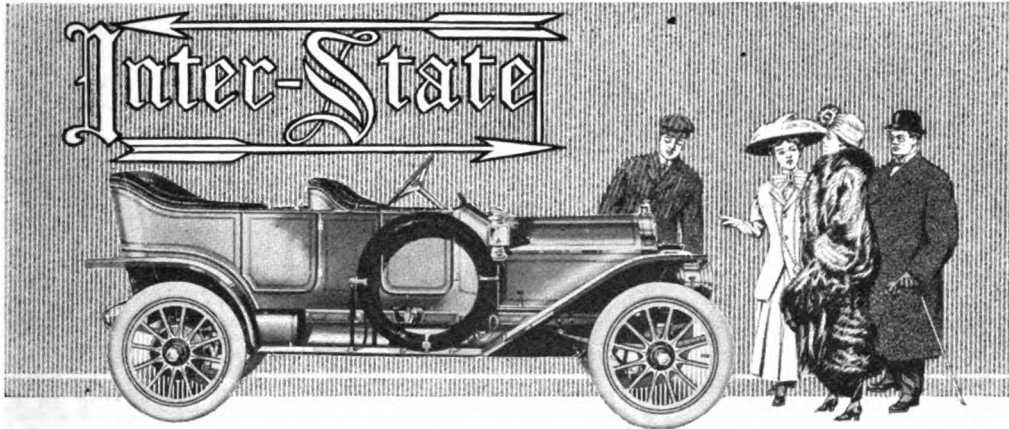
TRIPLE TREAD MANUFACTURING CO.

1542 Michigan Avenue, Chicago, Ill.

542 Van Ness Avenue, San Francisco

52 Gertie Street, Winnipeg, Manitoba, Canada

Please mention the Automobile Dealer and Repairer when writing to advertisers.



Model 34A 5-Passenger 40-Horsepower
Price, \$2,000; including Special Equipment

Weigh Each Point—Compare Every Part. Let Real Value Determine Your Choice of the **Inter-State**

In other words, apply the same level-headed business principles to the purchase of your motor car as you do in buying ANY line of merchandise.

Compare. We do not want you to decide on an Inter-State just because it **looks** and **acts** like the thoroughbred it is. That is not the way we sell the Inter-State. We court your **comparison**, part for part, with any and all other cars. There is probably no great rush that would prevent such an investigation of comparative values. You will find that it is time well spent.

Then come the **records**. You won't have to ask for **Inter-State** records. We will give you a list of owners, neighbors of yours, to whom you are directed to ask how their cars behave after the months and years of service. You will, therefore, not only receive our words of commendation, but also the statements of the folks who have years of Inter-State ownership to determine their recommendation of this car!

There is a great big idea be-

hind the Inter-State. It is known in our factory and among our customers and dealers as the "high-quality-sane-price" idea. It has recently been complimented by the addition of four more acres of floor space to our immense factory. A logically increased demand for the Inter-State can now be satisfied.

We especially desire to send you our new catalog, a wonderful combination of honest, plain description and artistic appearance. The coupon reminder below is for your convenience.

Inter-State 1911 Models

consist of—

Five-Passenger Touring Car	"40"—\$1,750
Single Runabout Roadster	"40"—1,750
Double Runabout Roadster	"40"—1,750
Four-Passenger Demi-Tonneau	"40"—1,750
Four-Passenger Torpedo	"40"—2,000*
Five-Passenger Torpedo-Touring Car	"40"—2,000*
Seven-Passenger Torpedo-Touring Car	"50"—2,700†

*With special equipment. †Fully equipped.

The motor for the above mentioned "40" models is rated at 40 h. p. Average speed of 1,500 revolutions per minute. Bore, 4½ inches; stroke, 5 inches. L-head type. Valves all on one side, of large diameter, nickel-steel heads, careful

ground stems. Push rods with rollers of large diameter, providing rolling contact on camshaft. Valve adjusting screws with fibre cushion heads, insuring silent valve action. Crankshaft special carbon steel, drop-forged and double-heat treated. Mounted in three bearings of large dimensions, lined with die-cast white brass of best quality and lubricated by force-feed gear pump. Constant level splash oiling system, insuring accurate oiling at all times. Oil reservoir two gallons capacity. Sight feed in easily discernible position on dash, showing amount of oil flowing to bearings at all times.

Clutch and transmission housed in integral oil-tight case, separated by retaining wall, allowing use of special oils for each unit. Clutch of improved cork, insert design, operating in oil. Eight cork insert discs, enclosed between nine steel discs, providing contact of cork on steel. Throwout fork and collar provided with ball thrust, assuring long life. This construction provides a wonderfully smooth-acting clutch of long wearing qualities and gradual, easy, positive engagement. Gearset of selective type with three forward speeds and one reverse. Extra heavy pitch gears of chrome-vanadium steel. All clutch and transmission bearings are imported annular ball type.

Inter-State Automobile Co.
MUNCIE, IND.

Branch: 153 Massachusetts Ave.
Boston, Mass.

(109)

A. D. R. 4.

Tear Off This Reminder

Inter-State Automobile Co., Muncie, Ind.

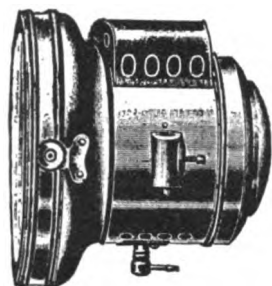
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Address

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**We Repair
Lamps at
Reason-
able Prices**



**Make
Them New
Again**

Brass Work for Automobiles

ANYTHING IN BRASS

We manufacture Yellow Brass, Bronze, Manganese Bronze, Phosphor Bronze and Aluminum Castings. In addition to a fully equipped Brass Foundry we have an up-to-date Machine Shop, Polishing, Buffing and Plating Departments and can furnish Castings finished complete according to specifications. We specialize on Aluminum Transmission Cases, Spiders, Control Brackets and Control Levers, etc.

We guarantee our work.

Send your blue-prints and give us an opportunity to quote

A trial order will convince you that we understand our business.

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New Castle, Pa.

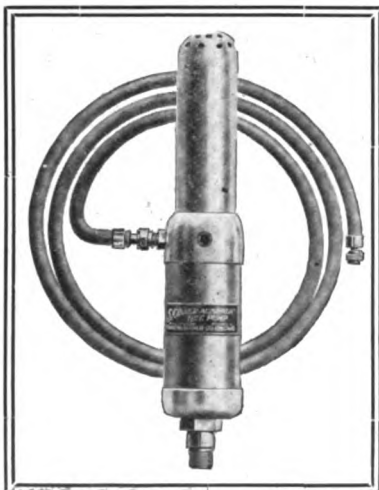
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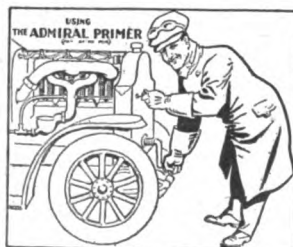
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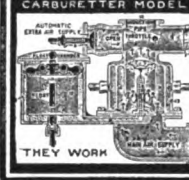
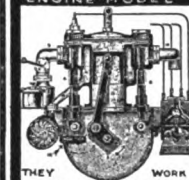
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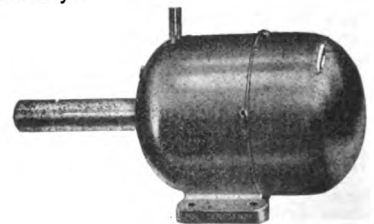
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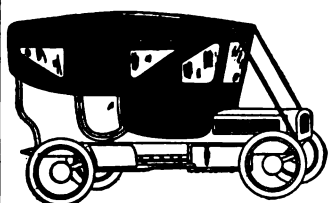


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31x4	17.50	5.00	36x3 1/2	15.00	4.00
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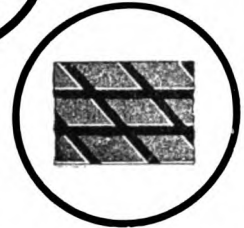
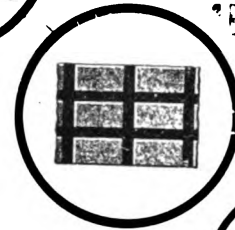
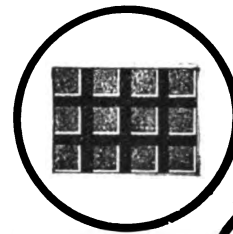


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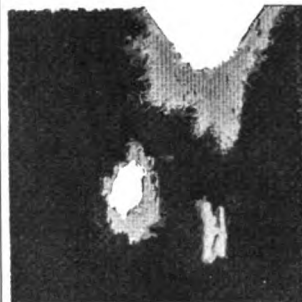
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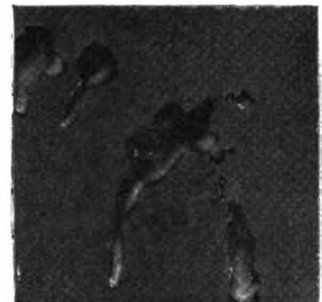
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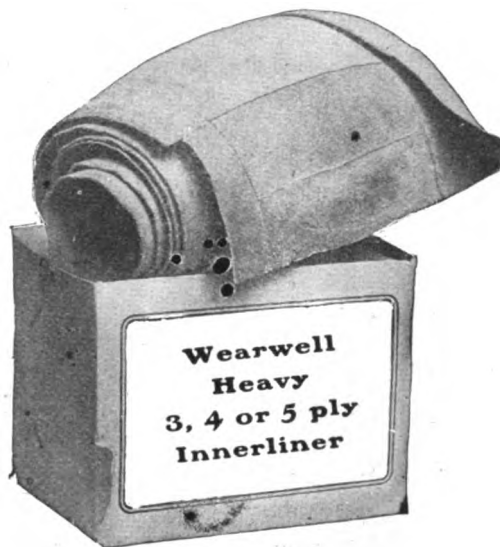
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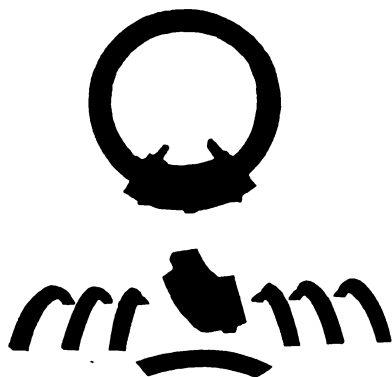
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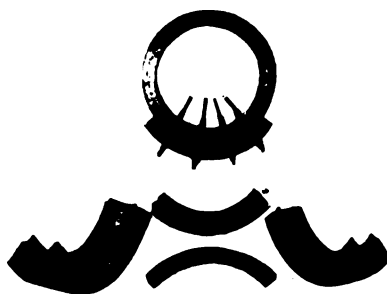
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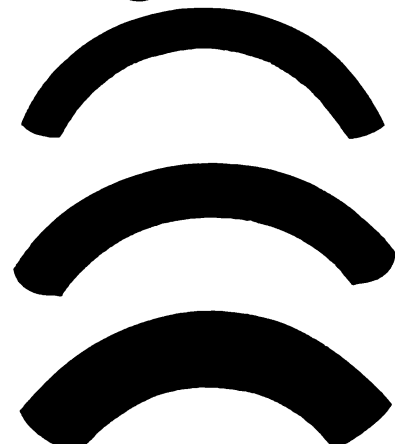
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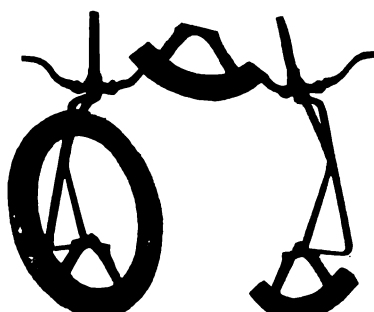
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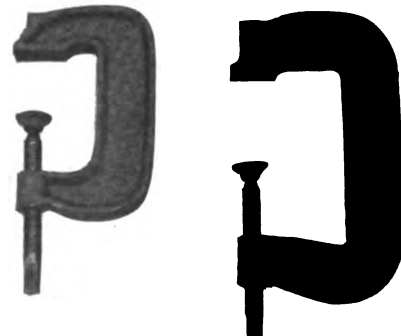
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VELVET AUXILIARY SPRINGS



Is the **ONLY** Device ever made which will make an Automobile ride as easy as a **VELVET CUSHION—ALL THE TIME.**

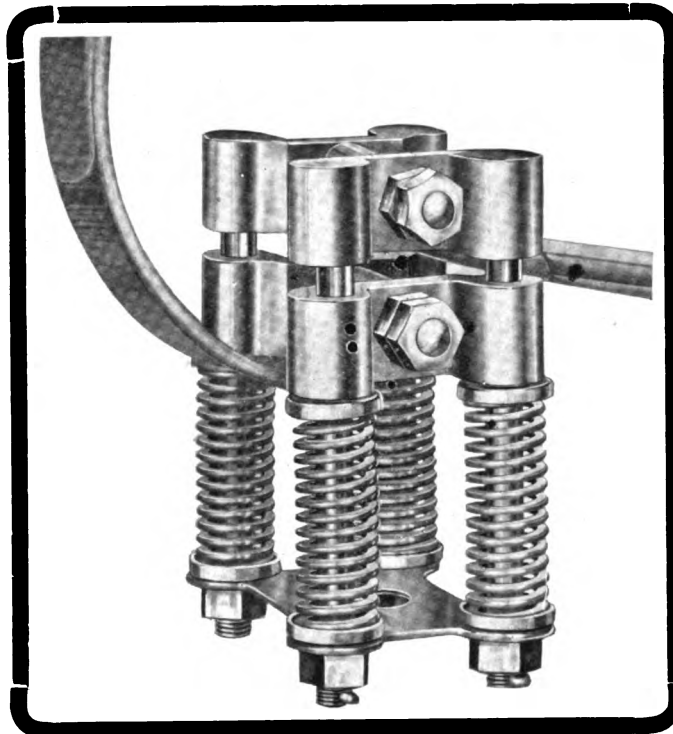
Insist upon having your car equipped with "VELVET" SPRINGS. Your car is only a half car without them.

These Springs not only absorb all heavy shocks, but the car rides on the sensitive coils and is soft and comfortable every moment the car is in motion. They do not stiffen nor deaden a spring, as is the case with shock absorbers or recoil checks.

You can ride at any speed over rough, joggly roads or cobblestones, and "VELVET" SPRINGS will "eat up" all the jerky, jolting motion.

Many officers and engineers of the largest Automobile factories in America are now using the Springs on their own cars, in preference to any other make.

Don't take our word, but try them!



You have never ridden in any car at any time as easily as these Springs make a car ride.

Send for booklet of letters.

They will save your tires, springs, engine, and entire car, and pay for themselves many times over in a season.

SPECIAL OFFER.—Fill the blank form below and send for a set now. You **take no chance**, for if not satisfactory, you may return in twenty days and money refunded to you. Send remittance with order.

Can be attached in a few moments. No boring of holes, no fittings necessary. Allow no side sway. Adjustable for different loads. Cannot turn or twist out of shape. Will fit any 3-4 elliptic, platform or scroll end spring.

Price, Car weighing under 2,600 lbs , \$18.50 Per Set for Rear Springs.
Cars over 2,600 lbs., - - 20.00 "
DISCOUNT TO DEALERS.

Fill Out and Tear Off Slip Below and Mail To Us.

JOHN W. BLACKLEDGE MFG. CO.,
1502 Michigan Ave., Chicago, Ill.

Dear Sir :

Ship us.....Sets of your VELVET SPRINGS.
To fit a.....Car.
Model.....Weight lbs.
Style of Rear Spring.....
Width of Rear Springs.....
Diameter of Spring Bolt
Signed.....
.....

New England Representative, W. J. CONNELL, No. 555 Boylston St., Boston, Mass.
San Francisco Agent, F. REVALK, 518 Van Ness Avenue.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



LET THE WORLD'S LARGEST MAGNETO FACTORY SERVE YOU

Remy Electric Company, with the world's largest and best equipped magneto factory, offers an unequalled service to users of motor craft. Its branches, salesmen, dealers, ignition experts reach you everywhere. Its engineers welcome the chance to help you solve your ignition problems.

Unlimited facilities, years of experience, desire to hold the leadership in this field, result in our building devices that give absolute and lasting satisfaction under most exacting conditions. Our Service Department renders users of Remy equipment prompt, intelligent, courteous information and assistance. Remy Service is complete and constant.

Remy Magneto is the evolution of years of successful manufacturing. It is the most reliable, the most satisfactory—the standard of efficiency. And its cost price shares with you, gains incident to the economics of large production.

Specify Remy Magneto upon your new car. Or let us equip your present machine with this perfected ignition. Remy Magneto means Ignition Satisfaction. Further information gladly furnished upon request.

REMY ELECTRIC COMPANY

Factories—ANDERSON, INDIANA—Gen. Offices

NEW YORK BOSTON DETROIT CHICAGO
KANSAS CITY SAN FRANCISCO



Some of Our Specialties

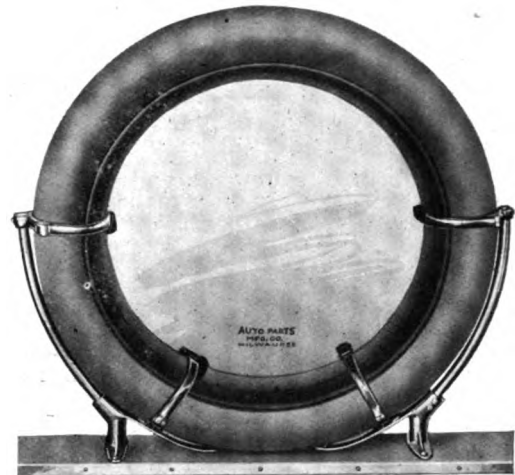


BADGER SPRING BUMPER

The reason there are not more Bumpers used is that owners object to the changing of the spring hanger bolt and drilling numerous holes in the frame. To attach our Bumper, drill one 5/16 in. hole in the end of side bar and fasten as shown in cut, which can be done in ten minutes, and will fit any car.

In case of an accident, a thrust is against the point of greatest resistance. The springs are oil tempered and of our own design, brackets of cast steel, bar of selected one and one-quarter inch steel tubing, brass covered.

WE MANUFACTURE
Emergency Tire
Clamps,
Gasolene and
Alcohol Vulcanizers,
Safety Grips,
Foot Rails,
Foot Pedals,
Automatic Grease
Guns,
Symphony Horns,
Wind Shields.



BADGER TIRE HOLDER

The Tire Holders can be bolted to the running board of the car, obviating the necessity of boring into the body.

They will hold one or two, three and one-half to five inch tires, and can be equipped with chain and padlock instead of straps if desired.

WRITE FOR CATALOG TO-DAY.

AUTO PARTS MFG. CO., 163 Michigan St., Milwaukee, Wis.

When You Have A Puncture

blow-out, cut or tear in your tire—no matter how large—do not waste time and money with old-fashioned patches or vulcanizing outfits. Use our system of "Cold Vulcanizing."

"TITE-WAD"
TRADE MARK
"CAN'T TEAR IT OFF"
THE RUBBER PUTTY

will make a permanent repair that is tough and elastic.

Take enough "Tite-Wad" to cover the injury and simply press it into place with your fingers. That is all.

**NO TOOLS
NO HEAT**

**NO EXPERIENCE
NO SKILL**

Tite-Wad makes an immediate and permanent repair and is part of the tire itself. Not merely stuck on.

Price \$2.00, prepaid. Enough for 40 punctures.

OUR PLAN FOR will interest every live one.

DEALERS

Write for Proof-patch and Prices.

PAGE-LESTER CO.

Dept. 3, 134 Van Buren St.,

Chicago, Ill.



PAGE-LESTER CO., Dept. 3, 134 Van Buren St., Chicago, Ill.
I enclose \$2.00 for which please send me one complete Tite-Wad outfit, on your guarantee to refund my money if I am not fully satisfied with it.
Name.....
Address.....
(If you are a dealer enclose your letterhead.)

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Uautoil WITH ENDURANCE AUTOIL

FROM PREMIUM PENNSYLVANIA CRUDE

**Because it does what it is intended to do—it
lubricates, but it does not carbonize.**

Results from carbon depositing cylinder oils cost motorists last year, over \$5,000,000, besides much loss of time, trouble, annoyance and "laid up" cars.

You may be the owner of the most costly car made, yet you place it on a par with a low cost car, so far as its efficiency and ability to make good are concerned, if—you allow the Motor to become choked with carbon deposits on account of the oil used.

How much greater the pleasure of Motoring are, when you have the assurance of knowing that, barring broken machinery, no thought need be given of being "hung up" somewhere, when on business or perhaps showing off the good qualities of the car of your choice to some friends, with a Motor that can be depended upon with absolute certainty, to "deliver the goods" under any conditions, because—it has the right oil. And yet, many anticipated pleasures are turned into great disappointments or even humiliations at a critical moment, just—because the oil don't suit the Motor.

You may be paying the highest possible price for your oil and think you are getting the best that can be bought, but—you can't fool the Motor, it knows.

There are just two vital points that cover everything required of oils for Gasoline Motor Cylinder Lubrication, viz.: to give efficient lubrication under all conditions, and to do it without leaving carbon deposits, i. e., burn up cleanly.

Almost any grade of Crude Oil will make oils that will lubricate. But only the superlative grade of Premium Pennsylvania Crude Oil, "Tiona Crude," the highest priced crude oil in the world, is good enough for making ENDURANCE AUTOIL. We pay the price and you get the quality in every drop—that lubricates, but does not carbonize.

If you could see how thoroughly the carbon—worth about \$15.00 per ton at the refineries, and so useful for commercial purposes in producing that intense blinding light in Arc Lamps, as the electric currents pass through it—is eliminated from ENDURANCE AUTOIL, in its manufacture, you could understand why we can offer ENDURANCE AUTOIL users, \$15,000 per ton, or at this rate per ton for any part, for any carbon deposits taken from their Motors that are made from the exclusive use of ENDURANCE AUTOIL. We could make our offer ten times this amount and be just as safe.

There is no substitute for ENDURANCE AUTOIL. It will increase your pleasures of Motoring and decrease your expenses. It will lengthen the life of your Motor by keeping it in perfect running order at all times and under all conditions.

Let us prove our claims by sending you without any advance payment, a trial shipment, all carriage charges prepaid to your city, for you to test on your car for 30 days after it arrives, before deciding to purchase. If you are not perfectly satisfied with it in every way after testing it thoroughly on your car, you may send it back at our expense and there will be no charge for what is used in testing. We take all the risk, your gain cannot be measured in dollars and cents alone.

SOLD BY DEALERS AND GARAGES, OR DIRECT.

Send to-day for FREE SAMPLE, PRICES and BOOKLET (A) on refining crude oil...

ENDURANCE AUTOIL COMPANY, Muncie, Indiana

ENDURANCE Cup Greases and Transmission Compounds have the same Endurance Qualities as our AUTOIL.

Dollar-Getters for your Workbench

Garage and Repair Men

THESE are the machines that will get more money for you in a season than any other part of your shop—and at the least outlay. There are always tires to be repaired, and auto owners are willing to pay big prices for perfect work done without delay. Repair men reap a golden harvest with

SHALER *Electric or Alcohol Heated* **Vulcanizers**

Cost less than 2¢ per hour to operate—no boiler to explode—absolutely clean. You simply connect to the city current and when proper temperature is reached, the patented **auto-matic** heat control regulates the current so that the vulcanizer is held at the vulcanizing point indefinitely. In ten minutes you can learn how to make a perfect repair.

Type B

It will vulcanize either one or two tubes at a time or repair cuts in casings while still on wheel. The patented handle permits the moving of the vulcanizer from one job to another while still hot. There is a kidney shaped plate for casing repairs next to the rim and a double concave face for large tread repairs. The swiveled clamp enables you to apply the vulcanizer in five seconds and get an absolutely uniform pressure on all parts of the repair.

Prices for Direct or Alternating Current \$20.00 to \$25.00

Type C

This vulcanizer will mend any blow-out or tear that is practical to mend in any casing, by the simplest and cheapest method known. With it, the new fabric is applied from the inside instead of the outside, thus saving cutting away a lot of good rubber and requiring only about half as much new fabric and only a small percentage of the new rubber as is needed when a job is done with a steam vulcanizer.

For Alternating Current - \$20.00
For Direct Current - - - \$25.00

Type E

Will repair a twenty-four inch slit in a tube or make six ordinary tube repairs at one setting. Indispensable in garages having a quantity of tube work. Each repair is independently removable, so that it is not necessary to wait until the large, thick repairs are cured before removing small ones and replacing them with new jobs.

For Alternating Current \$25.00
For Direct Current \$30.00

C. A. SHALER
COMPANY
803 4th Street
WAUPUN, WIS.

Send The Coupon For FREE Hand Book

If you cut out the coupon now and send it to us with your letter head showing you are in the auto business, we will send you, free, the booklet "Common Sense About Tire Repairs," and confidential trade discount.

C. A. SHALER CO., 803 4th STREET WAUPUN, WIS., U. S. A.

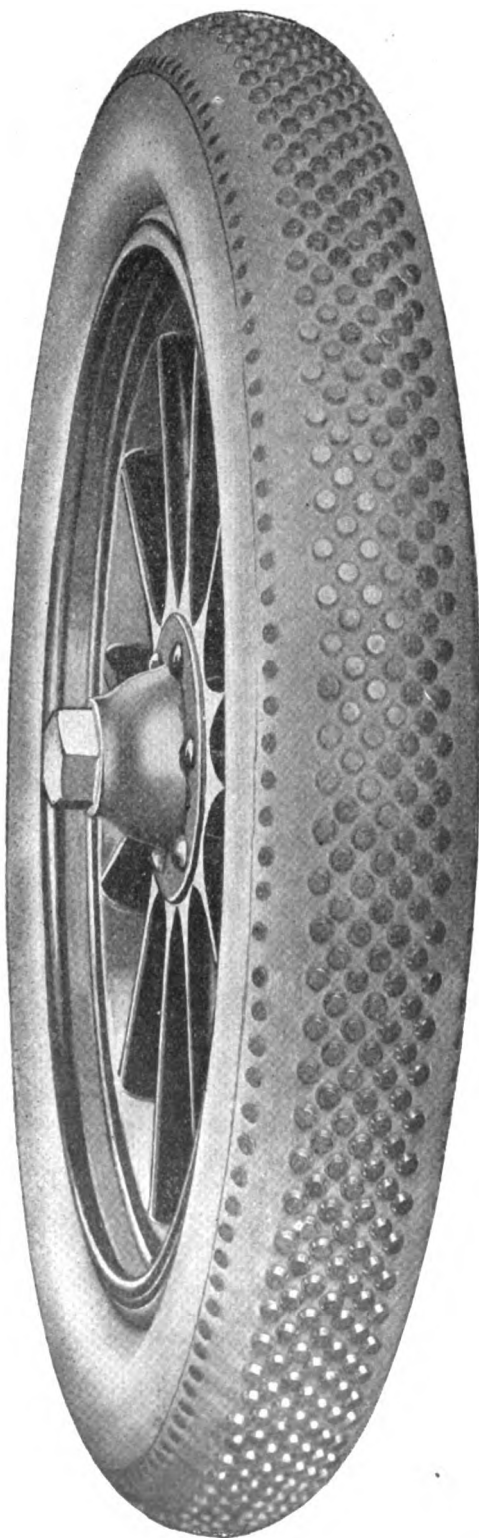
My lighting current is

Direct ☐
Alternating ☐
No Current ☐

Name

Address

TIRE FACTS



Air is the only perfect cushion.

There is no elasticity in the tire itself.

The tire transmits the shock to the air cushion, which absorbs it.

The tire prevents the escape of the air cushion through leaks caused by punctures, blow-outs and wearing-out.

The tire provides the traction to convert energy into motion.

Therefore—

A satisfactory tire should combine materials giving resiliency, strength, imperviousness and a non-slipping surface.

The KING Combination Tire

is the only tire which possesses **all** these requisites. There is no other tire like the King as its special features are fully protected by patents against infringement.

It is **not** a tire protector, tire cover or tread but a **complete tire** and carries a **Steel Shod Guarantee** of double mileage and against punctures and blow-outs.

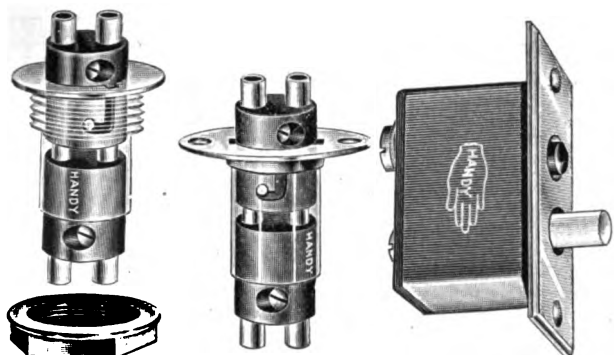
Don't compare our prices with others without comparing our goods—that is all we ask—we invite such comparison.

KING LEATHER TIRE CO.
3432 Vliet Street, Milwaukee, Wis.

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"HANDY" (TRADE MARK)

SWITCHES AND CONNECTORS



No. 4500—Dash Receptacle and Plug

No. 10000—Edison Receptacle and Plug

"HANDY" Flush Push Switch

More in Our Catalog



Chicago Electric Mfg. Co.

530 Van Buren Street
CHICAGO, ILL.



TO AUTOMOBILE DEALERS AND REPAIRERS

If you knew positively that by the persistent and judicious use of a typewriter you could in 1911 double your last year's business you wouldn't hesitate an instant in purchasing one!

We have just issued a large illustrated book showing how the big city concerns have built up their immense businesses and shows how anyone in any class of business can increase that business by means of the typewriter. There are hundreds—yes, thousands—of persons in your territory who are interested in Automobiles, and Automobile Supplies and Repairs, and these parties are going to purchase somewhere. Why not send to-day for this book and let me show you how the typewriter will enable you to get this business? **It is Free!**

WRITE FOR BOOK
SHOWING HOW
YOU CAN

Double
Your Sales
WITH A
TYPEWRITER



THE FOX—"THE ONE PERFECT VISIBILE TYPEWRITER"—FOR 20 CENTS A DAY! Sent on **FREE TRIAL** to anyone—anywhere—at my expense—to be returned if not better than the best of other makes. If purchased you can pay me a little down after trial and the balance at the rate of 20 cents a day—no payments on Sundays and Holidays.

The Fox is Visible—you do not have to look beneath a lot of moving typebars to see what is written! It has a Back Space Key, Tabulator, Two Color Ribbon with Automatic Movement and Removable Spools, Interchangeable Carriages and Platens, Card Holder, Stencil Cutting Device and Variable Line Spacer with Line Lock and Key Release. Its Speed is fast enough for the speediest operator or slow enough for the beginner. It is extremely Durable and almost Noiseless.

Will You Do This Now? I want you to fill out the attached coupon and give me a chance to "show you"—at my expense—what I have. Remember, I belong to no trust—no combination—and no one tells me at what price I must sell nor on what terms I must sell.

SEND FOR MY CATALOG, ANYWAY!

Date.....191.....

**W. R. FOX, President, Fox Typewriter Co.,
6605-6615 Front Street, Grand Rapids, Mich.**

DEAR SIR:

Please send me a copy of your catalog and write me full particulars concerning your "20 cents a day" payment plan on the new Fox Visible Typewriter. It is distinctly understood that the signing of this coupon does not in any way obligate me to purchase, and that no typewriter is to be sent me unless I decide later to order one for free trial.

Name.....

Address.....

Business.....

Cutting CARS

give the purchaser the maximum of style, power and satisfaction for the money invested. Engineering skill of the highest order, ample capital, modern factory facilities and a willingness to sell on a modest margin of profit, make Cutting Cars at Cutting prices possible.

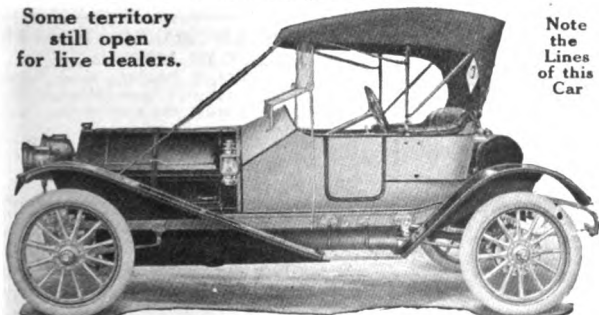
The Cutting Torpedo Roadster

shown below is distinctly in a class by itself—as to quality, workmanship, general appearance and price. It has 116 inch wheel base, 30 horse-power, 4-cylinder, long-stroke motor and beautiful lines and finish.

Write for details and specifications of our full line of cars of equal class.

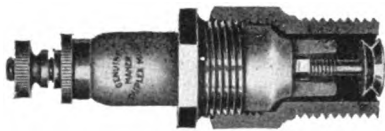
Some territory still open for live dealers.

Note the Lines of this Car



CLARKE-CARTER AUTOMOBILE CO., JACKSON, MICH.

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Pat. Feb. 7, 1911

The MAHER Duplex Multi

The Only Genuine Self Cleaning Spark Plug on the Market.
21,000 Miles Without Cleaning.

Jobbers and Dealers Write for Prices.

THE DUPLEX MULTI-SPARK PLUG CO., - - DEVIL'S LAKE, N. DAKOTA

ALUMINUM SOLDER THAT WILL SOLDER

Directions simple and easy to follow.
Write for prices.

CLUM & ATKINSON

881 Lyell Avenue, ROCHESTER, N. Y.

PALMER MOTORS AND LAUNCHES

Two and Four Cycle. One, Two and Four Cylinders. Stationary and Marine. One to Thirty h.p. Catalogue A FREE.

PALMER BROS., Cos Cob, Conn.
New York, 31 E. 2nd St.; Philadelphia, The Bourse; Boston, 85 Union St.; Providence, R.I., 22 Eddy St.; Portland, Me., Portland Pier; Seattle, Wash., 2nd First Ave.; San Francisco, Cal., 1st Van Ness St.



R. C. Allen Powell St.

United States Motor Co.

Brush	Stoddard-Dayton
Maxwell	Columbia
Sampson 35	Brush Delivery
Sampson Freight and Delivery Motors	

61st St. and Broadway
New York City



KENT'S BRAZING COMPOUND

With this, CAST IRON or STEEL of any size can be brazed by Brazing Torch or in a Blacksmith's Fire.
CIRCULAR FREE. Sample sufficient to brase 20 square inches mailed on receipt of one dollar.

S. W. KENT Cazenovia, N. Y.

Allen's New Discovery Metal Polish Powder

1 doz. Quart Cans, \$3.00

1 gal. Gasoline and 1 can Powder makes 1 gal. of best Liquid Metal Polish known
Sent on 30 Days Trial

WESTERN ROBE MILLS

43 Peck Court Chicago, Ill.

Gasoline Soldering Iron Blow Torch



A regular jack of all trades. Cuts the time and fuel bill.
Get our Free Booklet.

EMMELMANN BROS. MFG. CO.
INDIANAPOLIS, IND., U. S. A.

Western Buggy Washer

Special Sale Price, \$8.00

Satisfaction guaranteed.
Write for Jobbers' Discount

Western Robe Mills
43 Peck Court, Chicago, Ill.

SECTIONAL TIRES FOR AUTOMOBILES

Not a solid rubber tire, but the most resilient combination of rubber and air ever devised.

DO YOU WANT AN AGENCY?

SECTIONAL RUBBER TIRE CO.,
WOLLASTON, MASS.

DURYEA DELIVERY



A real business wagon. Fewest parts, low cost. Cheap operation and thoroly practical. It will surprise you. Investigate it now.

Chas. D. Duryea, Reading, Pa.

Personal Attention

GIVEN TO ALL ORDERS

I solicit your patronage to assist me to build up a trade on a business basis. I will be glad to quote you on any article for the Motor Car or Motor Boat.

J. STEWART SMITH, 1779 Broadway, New York City
Eight Years' Experience Bank References Given

ESTABLISHED 1873.
\$60 Lathe, Gap Lathes, Turret Engine Lathes and Shapers. Screw Cutting, Foot and Power Lathes, Hand and Power Planers, Hand and Power Drills, Chucks, Emery Wheels, Outfits. Tools especially for Blacksmiths, Electricians and Bicycle work. Catalogue Free.

SHEPARD LATHE CO.,
141 West 2d Street, Cincinnati, Ohio.

Don't Use Two Sets of Plugs

—GET THE—

Superior Double Spark Plug

PRICE, \$1.50

SUPERIOR MOTOR SPECIALTY COMPANY
44 North 4th Street, Philadelphia, Pa.

GEISZLER NON-SULPHATING STORAGE BATTERIES

LIGHTING AND IGNITION

GEISZLER BROS. STORAGE BATTERY CO.

BEST BY TEST 517-520 West 57th Street New York City **SEND FOR CATALOG**

LET US SAVE YOU ONE-THIRD TO ONE-HALF ON YOUR AUTO SUPPLIES.

We Undersell All Competitors.

See Our Prices in Free Catalog.

Write for Our Mammoth Illustrated 1911 Catalog.

AMERICAN AUTO SUPPLY CO., Dept. B,
1697 Broadway, New York City.

THE GUS BALZER CO.

1777 Broadway, In the City of New York

MANUFACTURERS OF

Meritorious Automobile Specialties

Bouquet Holders, Trade Names, Monograms, Mirrors, Stevens Igniter, Stevens Carburetor, Radiator Cap Ornaments, License Plate Holders, License Plates, Lamp Numbers, Running Board Foot Scrapers, New Chauffeur's Badge Holder.

GASOLINE STORAGE UNDERGROUND OUTFITS

\$12.50, \$25.00, \$35.00 and up.

GOOD GOODS. LOW PRICES.

LUBRICATING OIL TANKS ALSO.

\$3.50, \$5.25, \$6.50, \$10.00 and up.

Cabinets, \$15.75 to \$100.00.

Oily Waste Cans, meeting insurance requirements

Accurate Measures, and good funnels.

Kamp Kook's Kits that please tourists

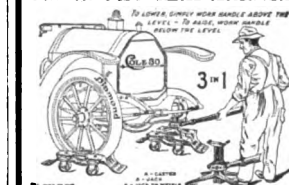
Ask Your Dealer. Send for Catalogue.

MANUFACTURERS SINCE 1889.

F. CORTEZ WILSON & CO.,

247 Lake Street, Chicago, Ill.

MORWOOD 3-in-1 VEHICLE CASTER JACK AND JACK ON WHEELS.



Automobile can be moved while on the jack. Frame one piece malleable iron; ball bearing casters delicately respond, permitting auto to be turned or moved easily in any direction.

Pat. June 25, 1907; Oct. 25, 1910.

Write for descriptive circular
AUTO & ACCESSORIES MFG. CO.,
408 Continental Bldg., Baltimore, Md.

DELTA SPARK PLUGS

A BETTER PLUG CANNOT BE MADE

DELTA MFG. CO.
Bloomfield, N. J.

WINESTOCK SPARK PLUG

QUICK DETACHABLE

"Mail us this ad"—It entitles you to dealers discount.

KNAPP-GREENWOOD CO.
11 Pemberton Square, BOSTON, MASS.

EBERMAN AUTO POWER TIRE PUMP

The AUTO ENGINE does the work, inflates the tires. Guaranteed to give satisfaction and to do all and more than we claim. It's a labor saver.

Agents Wanted Write To-day
HARRY H. REYNOLDS
254 Dearborn Street Chicago, Ill.

ATTENTION E-M-F OWNERS.

WE HAVE adjustment fixtures for E-M-F push rods which make accurate adjustments and does away with noise and rattle.

Autoparts Mfg. Co., Detroit, Mich.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

GET IN THE GAME!

AMERICAN RETREADER.

Heating Plant, Boiler and Vulcanizer all in One.

60 Pounds Steam
from Cold Water
Generated in
25 Minutes.

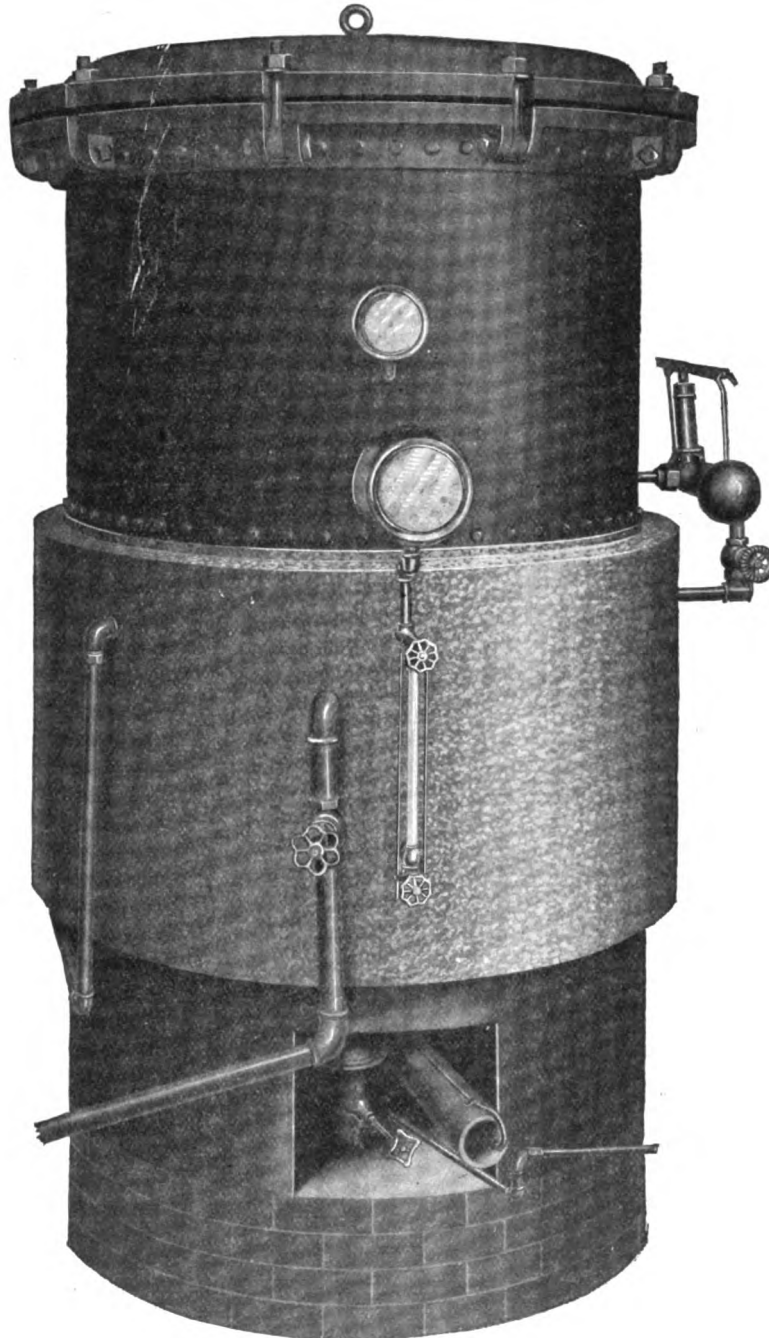
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No Coal Bin—
No Boiler Room—
No Engineer to
Watch.

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Costs a Dollar to
Run it for
a Day's Work.

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Gasoline is the
Fuel.

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No Condensation
in the Kettle.

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Handles Any Size
Tire Including
42 inches
Diameter.

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Always Ready
and Never Fails.

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MANUFACTURED BY

THE BAUM IRON COMPANY, Omaha, Neb.

AGENTS: C. J. Smith & Co., St. Paul; Jas. L. Gibney, Philadelphia; Post & Lester, Hartford and Boston; Coughlin & Davis, Cincinnati, Ohio; Alexander Seewald Co., Atlanta, Ga.; Chanslor & Lyon, Los Angeles.

Write direct or to above agents.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

"BECCO" SPECIALTIES

SAVE TROUBLE

Standard Terminal.

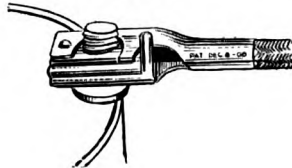


Instantly locates ignition troubles. Has a "sparking gap" (see cut) which makes it an ignition terminal and spark-tester combined. Can be used with about any spark plug, easily attached and detached. A little thing and inexpensive, but likely to earn its cost a thousand times over. **Price, 15c Each.**

Battery Connector.

It simply cannot break or work loose or go wrong. Every driver has known the annoyance connected with battery-connectors. This connector is a positive assurance against such annoyance.

Price, 10c Each.

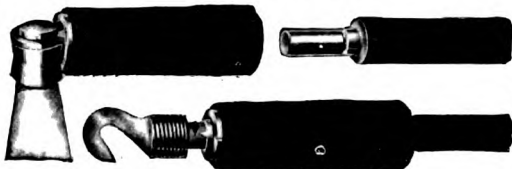


Wrench Set.



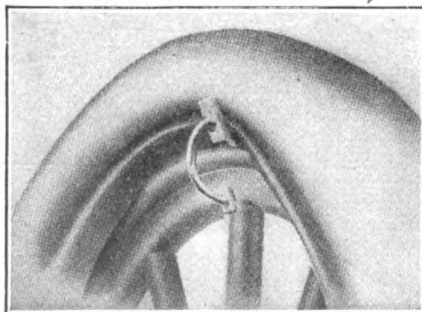
An unique combination tool for small bolts and nuts. Fits eight different sizes of nuts and also provides a screwdriver. Indispensable for the modern auto tool box. **Price, \$1.00 Each.**

Special Terminal.



Has not only the "Sparking Gap" feature, but a "Cut-out," so that any cylinder can be electrically disconnected, without removing the terminal from spark-plug. All parts are insulated by means of a fibre sleeve. Impossible to receive an electrical shock, while manipulating. This is the last word in Sparking Terminals. **Price, 35c Each.**

Tire Grip.

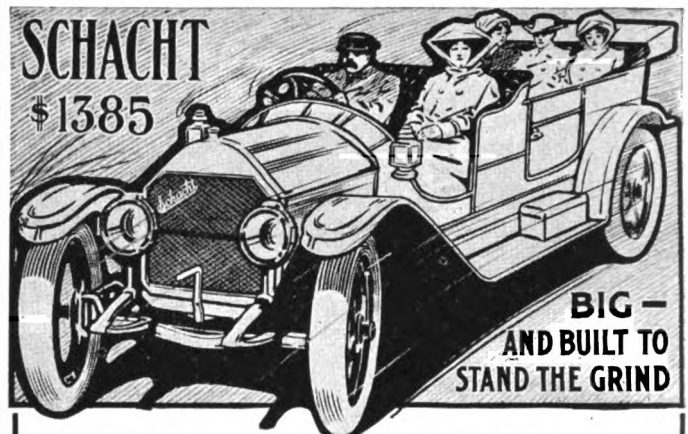


For use with Clincher Tires. It takes the place of a man. When you are putting on a tire, the lip of course has to be held in the rim of the wheel at one point, or the tire will keep creeping out as you work around to get it in. Ordinarily another man has to help with a tire iron to get the tire in place. **Price, 50c Each.**

If you cannot get "Becco" Specialties from your dealer, we will supply, postpaid, at the above prices.

Good Dealers Wanted As Agents.

THE BECK COMPANY, Box 67F, Rockville Centre, N. Y.



THE INVINCIBLE SCHACHT

The Car That Clinches Sales For You

Here, Mr. Dealer, is a **really big car**—at a **really low price**—a 40 horsepower engine—120 inch wheel base—a big, roomy body in which 7 can ride easily—all for \$1385.

There is not another car on the market that can duplicate the Schacht **even on these three important points**, for anywhere near the money—and specification for specification the Schacht will save from \$400 up over any car made.

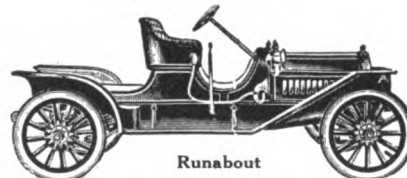
These are real **talking points**—real **selling points**—but they are only half the story.

In addition to its bigness—its power—its speed—the Schacht is built in a way no other medium priced car has ever been built. A great big engine—the biggest crank shaft ever put into a four cylinder car— $4\frac{3}{8}$ in. and $4\frac{1}{2}$ in. bearings—gears and transmission as big as you find in the average "sixty"—every part built to stand the hardest kind of hammering and come back for more.

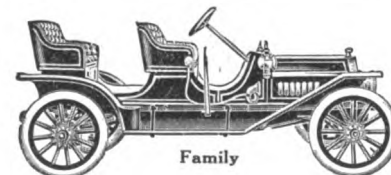
One good look at the Schacht—its bigness—power—the way she's built—makes the red blooded man or woman keen to drive it. The margin of safety in every part makes it the one car for the conservative.

At \$1385 the Schacht is a cinch to sell.

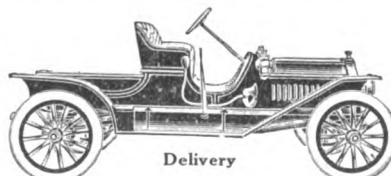
3 in 1 Car



Runabout



Family



Delivery

There are a lot of people who want a smaller car. To such a class the Schacht 3 in 1 offers many big advantages. It is not only striking looking and able to stand the racket of hard usage under all conditions, but its quick and easy convertibility from a runabout to a touring car or a delivery wagon make it the most useful and easiest selling car of its class on the market.

The Schacht is the line **you've** been looking for—let us prove that to you.

THE SCHACHT MOTOR CAR COMPANY

2757 SPRING GROVE AVE.

CINCINNATI, OHIO

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MILLER'S VULCANIZERS AND TIRE RELINERS.

First quality Imperial Clincher, Dunlop 5 per cent. higher. Nearly all standard makes of tires at dealer's lowest prices.

Size	Case	Tube	Reliners 19-oz. tire cloth	Size	Case	Tube	Reliners 19-oz. tire cloth
28x8.....	\$10.00	\$2.75	\$3.30	32x4.....	\$19.90	\$5.45	\$5.40
30x8.....	10.70	2.85	3.42	33x4.....	20.60	5.50	5.52
32x8.....	11.10	3.00	3.54	34x4.....	21.70	5.75	5.70
29x3½.....	13.20	3.50	4.00	35x4.....	22.20	6.00	5.82
30x3½.....	14.40	3.75	4.08	36x4.....	22.80	6.25	5.94
31x3½.....	14.80	4.00	4.14	32x4½.....	25.40	8.60	6.60
32x3½.....	15.60	4.25	4.20	34x4½.....	26.90	9.10	6.72
34x3½.....	16.80	4.50	4.88	35x4½.....	27.80	9.35	6.84
36x3½.....	17.90	4.75	4.56	36x4½.....	29.10	9.60	6.96
30x4.....	18.10	4.75	5.16	37x4½.....	29.90	9.90	7.14
31x4.....	19.20	5.00	5.28				

TERMS—Cash with order; money refunded on receipt of goods if not satisfactory. If interested in vulcanizers and rubber specialties, write for our 28-page catalog. We also do tire repairing.

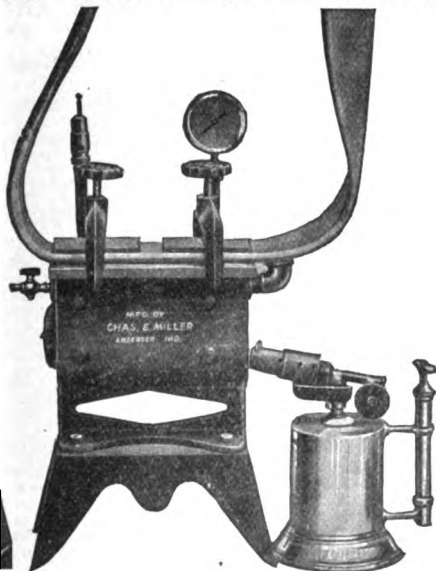
If you want liners made of 14-oz. cloth instead of 19-oz. you may deduct 20 per cent. from these prices. If interested in bicycle or automobile tires, either first or second quality or second hand, write for prices.

Miller's Tire Reliners.

Are made of three and four ply 19 ounce tire fabric, vulcanized in shape to lay on the inside of the casing, extended clear around to strengthen same. Can either be cemented in or laid in loose and makes the tire difficult to puncture, also reinforces weak casings. Packed neatly one in a box.



MILLER'S NEW STEAM TUBE VULCANIZER.



The above is a new steam tube vulcanizer that we are just placing on the market. It is especially adapted for repairing automobile inner tubes. Has a machine surface 5x19 inches, and will repair two tubes at one time. The steam is generated from a common blow torch flame, which passes through a flue 20 inches in length, giving heat surfaces sufficient to generate 40 pounds of steam in ten minutes. It is furnished complete by us, with pop valve, steam gauge, 2 clamps, base and gasoline blow torch for \$15.00; without blow torch, \$12.50. Jobbers who wish to catalog same, write for cuts.

Miller's Circular Lock Patch.

Is made of heavy tire cloth vulcanized to encircle the inner tube and formed to the natural shape of the inside of a tire. By encircling the inner tube you get much greater efficiency than it is possible to get by laying the patch over a hole in the casing. You can also use this patch for a rim cut as there is a thin edge which can be brought around under the tire, giving great strength at this point.

PRICES.

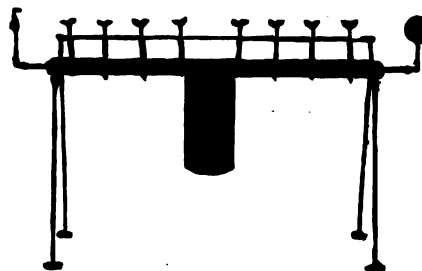
2½ inches, each \$0.78 | 8½ inches, each \$1.08 | 4½ inches, each \$1.88
3 " " .90 | 4 " " 1.20 | 5 " " 1.50

Miller's Inner Tube Patches and Valve Seats.

Made of good grade rubber and in all sizes. Where extra large quantities are ordered can put the customer's name on patch.

Price, \$2.50 per Pound.

Miller's Inner Tube Vulcanizer.

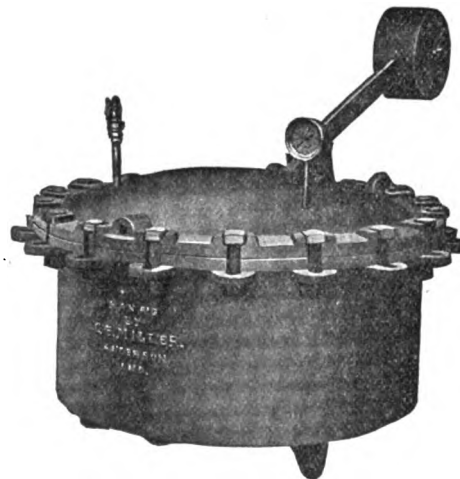


Has a tube plate 54 in. long and 4 in. wide with plain surface highly polished, complete with stand, 12 flue boiler, gas burner, water glass, pop valve, steam gauge, 8 clamps and two molds for curing the treads of casings, price \$25.00; gasoline burner \$3.50 extra. Tube plate only with steam

gauge and 6 clamps, price \$10.00.

We also manufacture various other vulcanizers. No. 1 and No. 2 adjustable sectional vulcanizers, complete with boiler, \$85.00 each. Bicycle vulcanizers, \$7.50; Motor cycle vulcanizers, \$12.50; Tread Rollers, \$12.00; Kettles, \$115.00; Power wrapping machines, \$175.00 each. We do all kinds of tire repairing and carry a large stock of tires at reasonable prices. If further interested in vulcanizers write for catalog and special proposition.

MILLER'S KETTLE VULCANIZER.



This kettle vulcanizer is made in two sizes; small size weighs 2000 lbs., holds from 5 to 8 tires at one time, up to 38 inches Price, \$115.

Large size weighs 2500 lbs., holds from 7 to 10 tires at one time, up to 44 inches. Price, \$150.

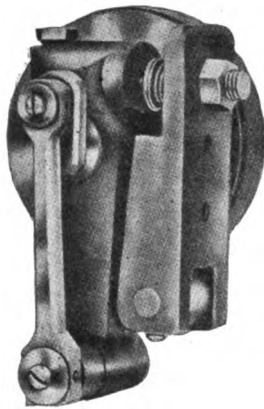
If you are interested in other styles of vulcanizers write today for our catalog, showing 27 different kinds we make. We also manufacture a full line of repair materials.

Write for samples and prices. They are interesting.

CHARLES E. MILLER, Anderson, Ind.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Hart Giant Pump



This pump is positively guaranteed for one year free from any defects and will pump 90 lbs. of air into a shoe in three minutes.

Pressure gauge goes with it.

Weight of complete pump only 10 lbs.

We want the privilege of giving every reader of this paper full

particulars concerning our pump.

Write at once for descriptive circular and price.

ADDRESS

HART & WIDDER CO.

511 West 21st St., New York City
Telephone, 1687 Chelsea.

Motorists in New York are invited to call and have their tires inflated free of charge.

Gasoline Pump for Private Garage.

This cut of the Eastern Pump is our specialty for Private Garages where they want the very best that is made at a reasonable price.



The Pump in the above cut pumps a given quantity to a stroke of the lever, and is fitted with shut-off valve and anti-drip nozzle; also fitted with hose connections. It is made of the best material and workmanship that can be put into a Pump.

Get full information by writing to

Eastern Oil Tank Co.

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F. W. Ofeldt & Sons,
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Manufacturers of
Blue Flame Kerosene Burner,
Safety Water Tube Boiler,
Automatic Water Regulator,
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Feed Water Heater,
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New Automatic Fuel Feed,
For all makes of steamers, including White's and Stanley's. Write for new Catalogue.

THE PITNER PUMP

The only tire pump that is guaranteed for 5 years' service. Ask us why.

Pitner Pump Co., 18 Michigan St., Chicago, Ill.

Just the thing for Floors and Running Boards of AUTOMOBILES

also

MOTOR BOATS

Not affected by gasoline, oil or grease. Made in any color.

Samples and prices furnished upon request.

THE NAIRN LINOLEUM CO.,
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W. & J. Sloane, 888 Broadway, NEW YORK CITY,
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HERE IS THE CORK

To stop the Biggest Leak in your Auto Budget

IT SAVES TIRES

Let us tell you more about it.

TIRE SAVING CO.,
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MENDENHALL'S ROAD MAPS

MAPS AND GUIDES FOR AUTOMOBILISTS.
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PRESERVE YOUR TIRES!

USE SLIKUP

N. B. ARNOLD

98 MONTAGUE ST. BROOKLYN, N. Y.

THE ONLY BOOK OF ITS KIND JUST PUBLISHED

168 Pages (8 x 11 inches)
ELABORATELY ILLUSTRATED ARTISTICALLY BOUND

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Every Auto owner is vitally interested in the subject of where to keep his machine. The most convenient place is on your own property in a private garage the architecture of which is in keeping with your house.

This book is the only one of its kind and shows a standard collection of New, Original and Artistic Designs for Up-to-date Private and Public Garages adapted to Frame, Brick, Stone, Cement, Stucco, or Concrete Construction, together with Estimates of Cost.

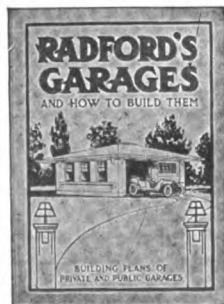
55 DESIGNS OF GARAGES 55

are shown by perspective views and floor plans giving dimensions, etc. Also remarks on GARAGE CONSTRUCTION explaining the advantages of each form of construction and giving details about the manner of erection, selection of materials, hints on supervision, etc., etc.

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It is just the book to give you important points and ideas if you are about to build a garage. Its information will save you money. Address all orders to

MOTOR VEHICLE PUBLISHING CO., 24 Murray St., New York.



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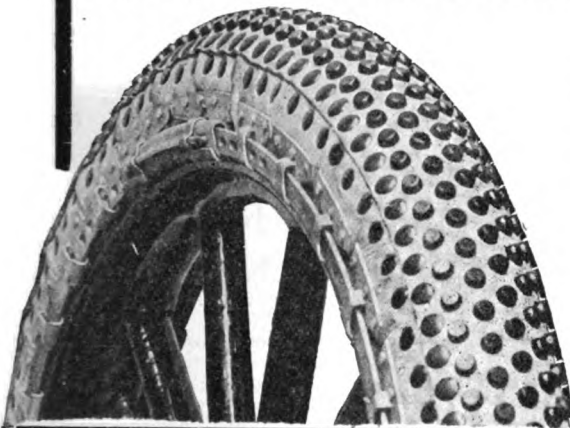
FOR LIVE AGENTS AND DEALERS

Here's an opportunity to take on a quick-selling, satisfaction-giving line, the "UNIVERSAL" adjustable and detachable full tread and the "UNIVERSAL" emergency tire sleeve. **Time-tried and proven successes.**

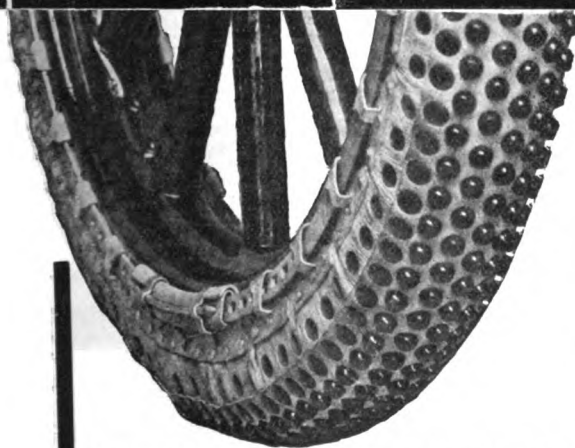
How many machines are there in your immediate vicinity? You perhaps haven't an idea. Just make an estimate and multiply it by four, (four treads to the car,) how many protectors are needed? **Pretty likely prospect for business, isn't it?** Of course you can't sell them all, but they're prospects, and you'll get a good proportion. And if the full tread won't interest them all, the "UNIVERSAL" emergency tire sleeve

will. **Every autoist must have a repair boot of some description.** How many of your friends, or how many autoists that you know, have a really efficient repair boot? **The "UNIVERSAL" emergency tire sleeve is the one sleeve that deserves the name of a quick-repair-patch. It is far and away the best thing of its kind on the market. It sells on sight. There's no lacing; it's adjusted in an instant and drawn to the proper tension with the little wrench. It stays where it's needed. It simply can't get away.**

Think this over. Give it your earnest consideration. **A canvass of the tire situation shows no likelihood of an improvement on the pneumatic tire.** The unsuccessful experiments of the past and the to-be-looked-for unsuccessful experiments of the future in seeking a substitute for the pneumatic tire, one that will possess all its virtues with



"UNIVERSAL" TIRE PROTECTORS SOLD HERE



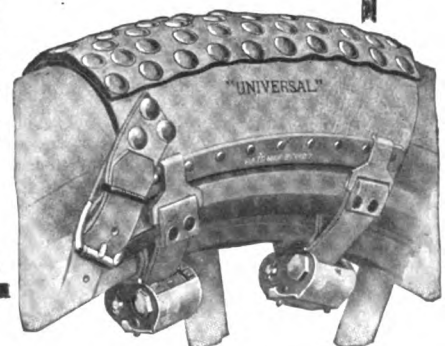
none of its weaknesses, acknowledge that an efficient tire protector is the solution of the tire problem as it stands today.

The tire protector is a live proposition. **IT HAS ARRIVED.** It is a business that is growing by leaps and bounds, and the man who interests himself now in the sale of tire protectors in his locality will profit correspondingly.

The "UNIVERSAL" has been pronounced, by a canvass among the experienced autoists, **THE STANDARD OF TIRE PROTECTORS, THE PROTECTOR TO BUY.** The "UNIVERSAL" agency is an acknowledged asset. If it's valuable to others, it is to you. The live agent and dealer cannot consistently neglect to consider our

proposition. We supply necessary printed matter and give you an attractive enamel sign, white letters on blue background, a reproduction of which forms the center of this ad. Write right now, today, for our proposition and booklet, "TIRES THAT NEVER TIRE," fully describing and listing the "UNIVERSAL" line.

UNIVERSAL TIRE PROTECTOR CO.,
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Auto Cases First Quality Clincher or Dunlap Type ALL NEW FRESH STOCK.

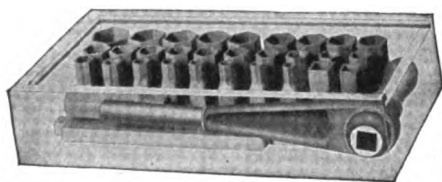
28x3 Case, -	\$10.30	32x3½ Case, -	\$16.70
30x3 " - -	11.30	32x4 " - -	21.45
30x3½ " - -	15.45	34x4 " - -	23.10

Tubes: 28x3, \$2.40; 30x3, \$2.65; 30x3½, \$3.25; 32x3½, \$3.50; 32x4, \$4.60; 34x4, \$4.80.

Send 10% with order. Send for price list on all sizes. I ship, allow tires to be examined before payment is made. *The largest Tire Dealer in the Central States.*

W. VANDERPOOL, - - Springfield, Ohio.

MOTOR CYCLE TIRES. SEND FOR MY PRICE LIST.



Reversible Ratchet Wrenches All shapes and sizes

If your dealer does not have this Automobile Wrench in stock, ask us and we will tell you who has. After 40 years of experience, we stand back of all we put out.

Circulars mailed free on request.

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Cuts Out All Uncertainty

MR. OWNER: Put it on your car and forget your ignition cable troubles—you'll have enough left to avoid lonesomeness.

PACKARD CABLE lasts for years because it is effectually protected from heat, grease, oils and moisture.

FULLY GUARANTEED.

THE PACKARD ELECTRIC CO.

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HANG ON TO YOUR OLD TIRES
THEY CAN BE USED FOREVER
WHEN COVERED WITH
STEEL

The Kimball Steel Protector makes Blow-outs, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires are as flexible as ever. Send for detailed information.
KIMBALL TIRE CASE CO., 174 Broadway, Council Bluffs, Iowa

AUTOMOBILE

Running Gears, with pressed steel or angle iron frames, also chain or shaft drive. Any wheel base up to 138 inch, and any height of wheels. **ALSO ALL KINDS OF BODIES** Wheels, Axles, Steering Devices, Springs, Etc.

Write for our new Catalogue at once.

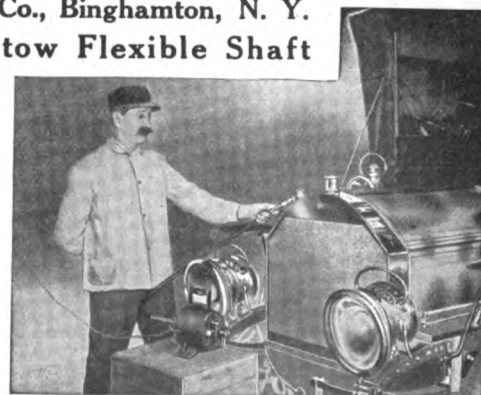
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Inventors and Mfrs. of the **Stow Flexible Shaft**

Electric Hand Buffer

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Signs
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Surfaces

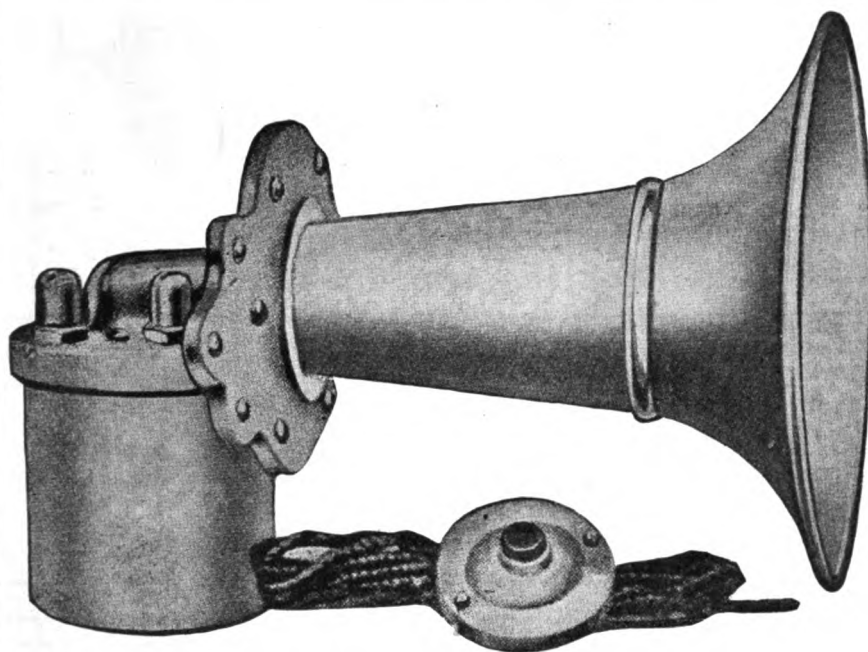


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The Arnold Alarm



THE PERFECT ELECTRIC SIGNAL

For Automobiles

For Motor Boats

HAS the right tone, quality and volume of sound to instantly attract attention. Can be heard for great distances on country roads and above the roar of city traffic. The ARNOLD ALARM is so adjusted that it requires less than one ampere of current; six dry cells will operate it most satisfactorily without renewal for a great length of time.

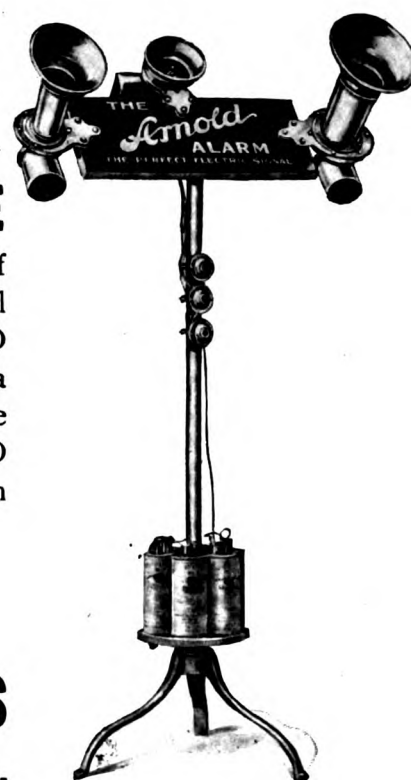
DEALERS

With your first order for one of each size ARNOLD ALARM we will furnish **FREE** one of the handsome display stands as shown, made of highly polished brass rod, with a handsome dash of metal and wood on which you may mount the ARNOLD ALARMS and attach batteries. Place this stand in a convenient part of your salesrooms and it will demonstrate and sell ARNOLD ALARMS for you. The ARNOLD ALARM is right in tone, quality and quantity, right in price, and is sold under our liberal guarantee.

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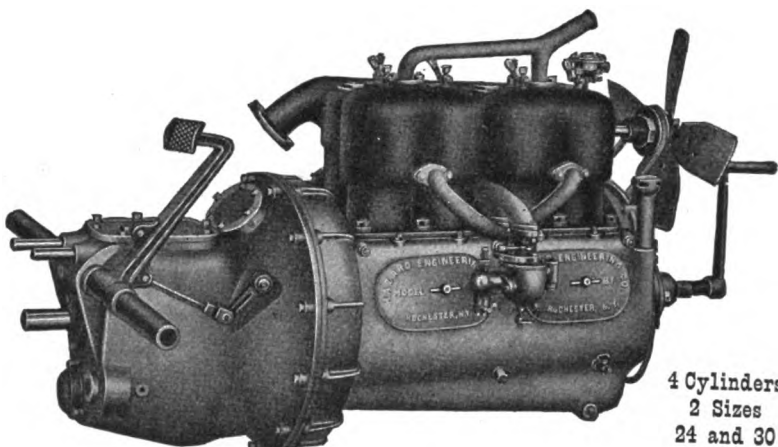
REPLACE THAT WORN OUT MOTOR IN YOUR CAR WITH A HAZARD UNIT POWER PLANT

The **THREE** Point Suspension Makes it Easy to Install in Practically Any Chassis at Small Cost.

**OIL TIGHT, DIRT PROOF,
POWERFUL, RELIABLE.**

Write For Prices.

HAZARD MOTOR MFG. CO., Scherer Street, Rochester, N. Y.



4 Cylinders
2 Sizes
24 and 30
H. P.

Thermoid

BRAKE BAND LINING

WEARS INDEFINITELY
SOLD BY ALL FIRST CLASS DEALERS

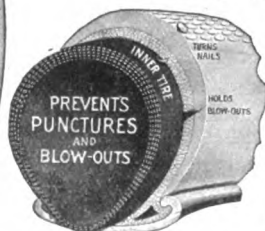
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THE MURRAY PATENT "INNERLOCK"

INNER TIRE

Is a Complete "Tire
Within a Tire."



Provides greatest mileage at lowest cost and reduces tire trouble to a minimum. Makes all tires, including old, weak and overloaded last until worn clear through—and then can be removed and used again.

The Best Tire Re-Inforcement

Being made four to six ply (as heavy as the tire) of patent construction **cross laid** fabric with self-sealed flap so that it fully re-inforces the sides (always the weakest point) making a BLOW-OUT, RIM-CUT or PUNCTURE ALMOST IMPOSSIBLE.

Also Largely Used in Taxicab Rental and Commercial Cars

Equip YOUR tires now and SAVE HALF your expense—the earlier placed, the greater extra mileage gained.

Agents and Dealers

wanted to handle this fast selling proposition. A full line of Blow-Out Patches and Reliners. There's money in this for you if you act quickly. Write for territory and proposition to-day. It's a winner.

DOUBLE FABRIC TIRE CO.

18 East 7th Street

Auburn, Ind.

New York Agency, Baker Sales Co., 1775 Broadway

MR. DEALER and MR. REPAIRER

THE SERVICE and SATISFACTION your customers get out of their cars, and YOUR SUCCESS and PROFITS in the Oil Business, DEPENDS ENTIRELY upon the QUALITY of the OIL you sell. It is an established fact that

HARRIS OILS

HAVE NO EQUAL for QUALITY, EFFICIENCY and ECONOMY in the Operation and Upkeep of their cars; and HAVE NO EQUAL for establishing your Oil Trade on a basis of PERMANENCY and PROFIT.

If you get your customers to try "HARRIS" OILS once they will so WHOLLY SATISFY that you can feel certain of their PERMANENT custom,—and REPEAT ORDERS, as you know, is what counts in the oil business.

"HARRIS" OIL prices are practically the same as for oils of an INFERIOR quality and IN-ADAPTED to Automobile Lubrication and that have nothing to recommend them except "cheapness" of cost and "cheapness" of selling price. The percentage of profit for you is as great in HARRIS OILS as in the "cheaper" oils, so let's get together on this BETTER OIL proposition;—at least let us send you full information and trade discounts.

WRITE TO US.

A.W. Harris Oil Co. 326 S. Water St., PROVIDENCE, R. I.
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Here are two news items appearing in the Chicago Inter Ocean and the New York American about

UNITED STATES TIRES

**Continental
G & J**

**Hartford
Morgan & Wright**

which will be of interest to every buyer of tires in the land.

No. I.

RECORD ORDER FOR TIRES.

**Contract for 50,000 Tires Placed with
U. S. Tire Co. by U. S. Motor Co.**

What is unquestionably the largest single order for automobile tires ever recorded in the history of the motor car industry in America has just been placed with the United States Tire Company, to be filled through its four big branches—the G. & J., Morgan & Wright, Continental and Hartford Rubber plants. The order is for 50,000 tires and was given by the United States Motor Company, which controls the output of Columbia, Maxwell, Brush and Stoddard-Dayton motor vehicles. This means that in future these well known cars will be shod with tires bearing the trademark of the United States Tire Company.

No. II.

TO GIVE TIRE ADVICE.

**U. S. Tire Company Establishes An
Important Department.**

Realizing that tire expense is one of the chief items of car maintenance cost and that as a rule tires are given less attention than any other part of the machine, the United States Tire Company has determined to add to its various branches a special department devoted exclusively to the exchange and promulgation of ideas and experiences bearing upon tire maintenance.

This department will solicit from the users of tires of all descriptions communications recounting difficulties encountered in the operation of their cars so far as tires are concerned, and will be prepared to provide the motorist with rules and advice for correction and perfection which will aid in getting the greatest possible mileage service at the lowest possible cost per mile. The new department will be specially adapted to an exchange of ideas by operators of all classes of motor vehicles and with these ideas passing through expert hands it is expected that the deductions and attendant recommendations will prove beneficial to all concerned.

We are getting the biggest tire orders in the country (See Item I) because we are giving United States Tire users more for their money than they can get elsewhere. (See Item II.)

**UNITED STATES TIRE COMPANY
New York**



Please mention the Automobile Dealer and Repairer when writing to advertisers.

Peerless Tire Repair Kit**\$1.00, Complete.**

For making instantaneous and permanent repairs on bursted or torn Outer Casings and Inner Tubes.

Requires no heat, as Cement and Vulcanizing Solution unites patch and torn parts into one solid piece of rubber that cannot be separated without tearing.

Get same from your dealer or direct by express, Prepaid on receipt of price.

**THE PEERLESS CEMENT CO., ∴ Akron, Ohio****C. O. T. TIRE PATCHES**

Mr. Dealer and Owner. Have you ever thought that to make a good repair you have got to have the correct article? You can get it in our Patches. They are made to absorb the cement, and have a heavy center and feather edge. Can be obtained from all jobbers.

**C. O. TINGLEY & CO.,
RAHWAY, N. J.****DEALERS**

Get Our Special Offer
on this money-making guaranteed

**"SAMSON"
Electric Horn**

No. 1 Outfit
Wt. Packed
6 lbs.

Cast Brass Base
Spun Brass
Projector, 16 in. long,
12 ft. Cord and Push.

STRONG — LOUD — SIMPLE — RELIABLE

Write for descriptive circular and Price List.
For sale by dealers everywhere.

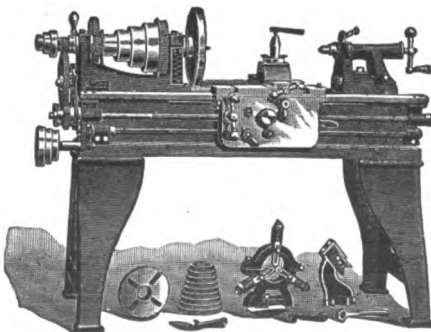
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State and 58th Streets CHICAGO, ILL.**Auto Directories Co., Inc.**

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Phone 858 Columbus.

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is the standard
low price, high
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for automobile
builders, repair
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3 valuable Short Cuts for Emergencies

Each of Goodrich Quality and precision of manufacture and each a prime necessity for every Garage and every Automobile Owner.

Goodrich Plastic

Many a good tire is lost through neglected cuts or gouges in the tread. Whenever a cut extends to the fabric, your tire is hurt "to the quick."

Moisture and dirt penetrating through even an inconspicuous cut, will creep along the stoutest fabric, like oil in a wick, and soon disintegrate it—perhaps a foot or more away from the cut.

A pinch of Plastic prevents the small Sand Blisters, which mean Big Blow-Outs.

Wash out and thoroughly dry the cut. Then apply Plastic. It "stays put."

In small cans containing two ounces. Price 50 cents.

Goodrich Protection Patch

Designed in particular to accompany and make doubly effective the Goodrich Emergency Band, but can be employed separately to good account.

Fitted against the inside of the case at the point of rupture and prevents the inner tube from working into the break, and the resultant injury that is bound to come from pinching.

The Goodrich Emergency Band and the Goodrich Inside Protection Patch constitute a handy repair of aids that no tire user should ever be without.

Goodrich Emergency Band

A piece of good rubber and fabric shaped to fit snugly against the tire and around the rim and held in place by means of cord laced through the eyelets of the band and around the felloe of the wheel.

It makes a temporary but effective repair of any break or cut in the tire.

Easily and quickly applied and stays put. The cost is trifling; the saving may be immense.

THE B. F. GOODRICH COMPANY

AKRON, OHIO

Largest in the World

**Branches in the
Principal Cities**

**Wholesale Tire
Depots Everywhere**

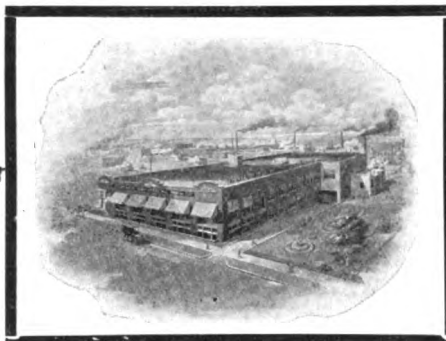
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746 So. Pierce Street, Milwaukee, Wis.

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Our New Factory—
The largest of its kind devoted
exclusively to the manufacture of
automobile accessories.



All our products are high grade
in quality, workmanship and finish
and you will find them salable
and profitable.

"Superior" Grip Tire Chains

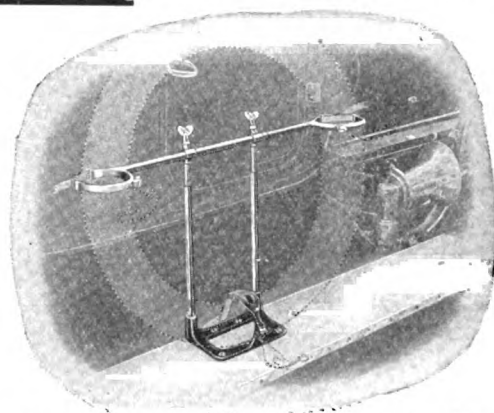


Insist upon getting "SUPERIOR GRIPS" in
light gray sacks.

Do not confuse
our chain with the
ordinary chain
with which the
trade is familiar
and which usually
wears out in about
thirty days if used
on hard pave-
ments. "Superior
Grips" are super-
ior to all others.
They are SPECIAL
HARDENED and
will stand rough,
hard usage.

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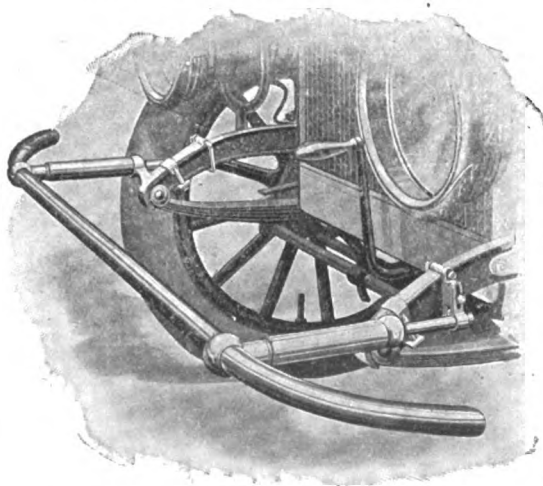
Fills a Long Felt Want.



Contained entirely on the running board. Therefore
it is unnecessary to drill holes or otherwise disfigure
the body of the car. Can be adjusted to fit any sized
tire. Finished in brass or nickel. Made in two sizes.

"Protect your Lamps and Radiator."

The "UNIVERSAL" BUMPER



Will fit any car without drilling holes or removing
bolts. Simply clamps to the frame. Strong, service-
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Our Latest.

Imported
Plate
Glass.
—
Adjustable
Brace Rods
allow it
to be laid
over hood
when not
in use.
—
Clear
Vision.



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USERS of our Tire Protectors and Emergency Patches say:

"ONCE ON, THEY ARE THERE TO STAY."

And There Are Reasons A MANUFACTURER of

anything will contend that his goods are as good, if not better **better**, than those offered by his competitors. But a manufacturer's word is not the last word. Let the buyers have **their** say—then you get **facts**.

Mr. E. A. Hurt, Agent for the G. C. & S. F. Railway, writes under date of July 25, 1910, as follows:

For more than a year I have run my car, having had it fully equipped with your protectors immediately after getting the car, and have never had the slightest tire trouble. On examining my casings recently they showed to be in just as good condition as if they were new, without having received a single puncture, rim-cut or blow-out.

I have particularly noticed the durability of my tires, and apparently the protector entirely relieves the rubber casing of strain, making the casing itself act as a cushion for the inner tubes, completely excluding water, sand or gravel, and holding the air perfectly.

On one occasion I ran my car **Three Months Without Pumping the Tire**, then only to take up the slack naturally brought about by the slight leakage of valves.

They are very durable, practical and add to the grace of the car, and remove all possibility of punctures, blow-outs, skidding and the dangerous accidents that they cause. No man owning an automobile can afford to run his car without them.

Mr. Hurt has here told of the salient features concerning our Protectors as well as we could tell them. We have hundreds of other testimonials on file of the same tenor. Our goods are

Approved—Always—Everywhere

Our Emergency Patches are made of the same materials as the Protectors, and are attached in the same manner. These Patches positively have no equal. They are **firm** and **permanent**—not temporary.

Write for Illustrated Booklet and Prices.

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Main Office and Factory: Main Street and Ave. G, Midlothian, Texas.

BRANCH OFFICES: 411 Slaughter Building, Dallas, Texas; 167 Adams Street, Chicago; 941 Liberty Street, Pittsburg, Pa.; 15 Park Avenue, Rockaway Beach, New York City; 312 Gibbs Building, San Antonio, Texas; Wawanesa, Man., Can.

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valuable
Book FREE*

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Go Over This Partial List of Subjects Treated:

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*Fill
in
and*

Magneto
Type at
\$1.25
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at \$1.00

Reliance

(REG. U.S. PAT. OFF.)

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this
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JEFFERY-DEWITT CO. (Auto. D. & E.)
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Please send me your book, "Ignition and Spark Plug Talk."

Name.....

Address.....



SPARK PLUGS

produce a more intense spark and use less battery power than any other plug. Absolutely soot proof, and carbon proof, do not require cleaning because they are proof against any and every combination you can find in a gasoline engine cylinder. Are absolutely infallible when short circuiting matter is encountered.

Reliance Magneto Spark Plugs cannot foul even when an excess amount of oil is used.

Sold by leading jobbers, dealers in auto accessories everywhere. If your dealer can't supply you, order direct from factory; shipped to you prepaid at the prices quoted.

Jeffery-Dewitt Company

Makers of Reliable Spark Plugs
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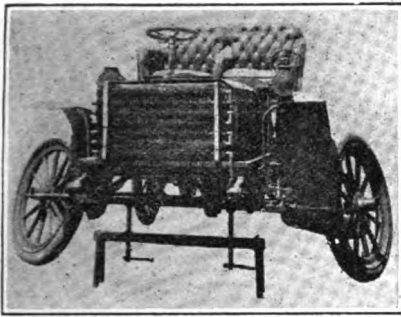
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ADJUSTABLE
TRESTLE JACK**
For Auto Shop and
Garage.

One man can lift and set
up any vehicle.

Made in four different
heights, from nine inches
to any height desired.

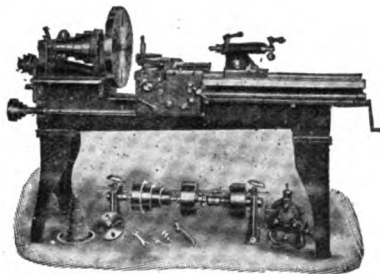
In automobile garages
this trestle jack can be
used to many advantages.

Cut Shows Jack in Use, and Auto Wheels Taken Off.

Send for Catalog and full particulars.

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13-22" Sliding Extension Gap Lathe



This Lathe swings
13 1/4 in. over top bed,
22 1/4 in. thru gap, and
the gap opens 18 in.
wide.

The 5 1/4 ft. bed takes
up to 54 in. between
centers, while our 7 1/4 ft.
machine takes 96 in. be-
tween centers when ex-
tended.

Just the thing for gar-
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and saves investing in
a large expensive lathe.

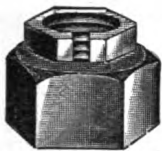
The machine is built
strong, rigid and ac-

curate, and has all necessary accessories as shown.

Descriptive bulletin and price at your command.

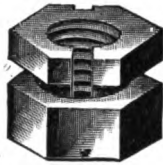
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Builders of the All Geared Drill.

A NECESSITY ON AUTOMOBILES!!!



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COLUMBIA LOCK NUTS.

They Will Not Shake Loose.

A LOCK NUT, NOT A NUT LOCK.

Our "Green and Yellow" booklet tells "WHY"
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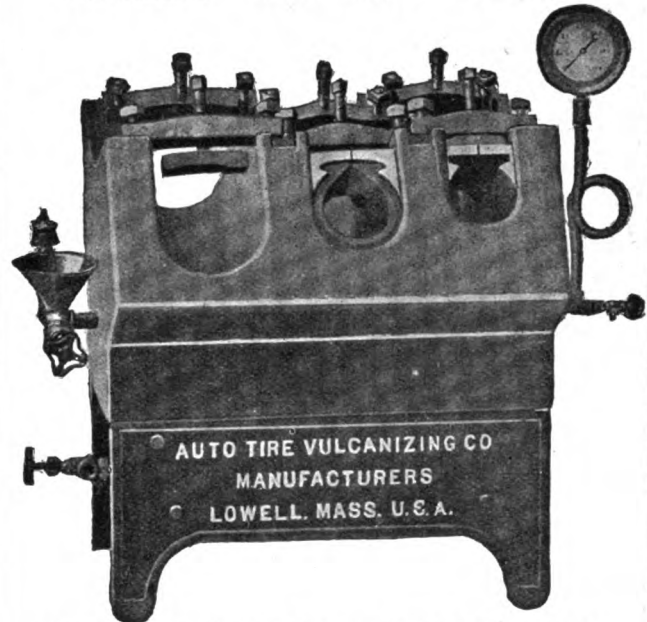
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Vulcanizer With Three Cavities**



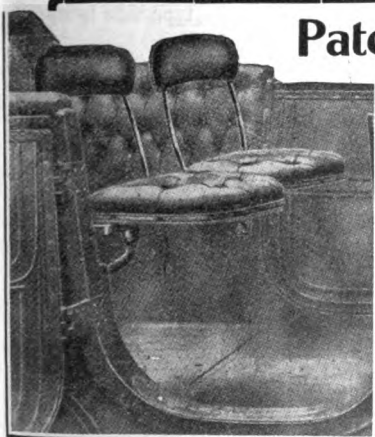
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New Improved Auto-Tire VULCANIZING MACHINE

simply and solely because it is the best there is in Vulcanizers at any price
and because the price isn't much, the operation is easy and profits are
exceptionally large.

Our machine is different, far better and more economical in opera-
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facts that will interest you and that will put you in the way of big profits.
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**Patent Luxury
Folding Seats**

Made from steel drop
forgings; artistic in
design and finish;
compact, rugged and
durable.

A necessity of high
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Write for catalog show-
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9 in., 11 in., 13 in. SWING.

Suitable for fine accurate work
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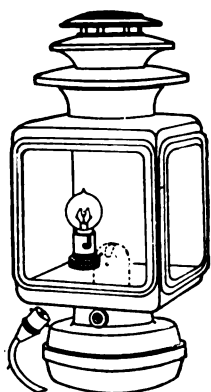
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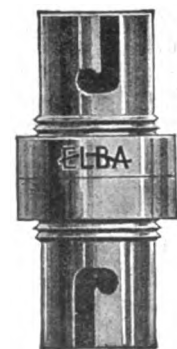
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Electric fitting
installed in a square
side lamp.

Lamps cannot work
loose in this socket
because they are *locked*
in place by plungers,
controlled by strong
springs.



TYPE U
Actual Size



LIGHTING BATTERY

Ask Dept. A for Bulletins No. 24
and No. 27.

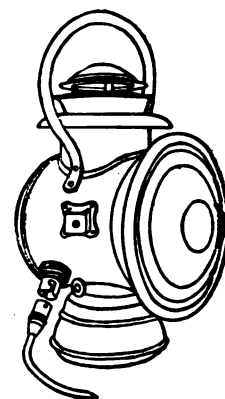
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Electric fitting
installed in a lantern
type side lamp.

Type "U" in side
and tail lights can be
adjusted to any de-
sired height. Type
"V" attachment plug
completes the fitting.



TYPE V
Actual Size

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I HAVE Solved the Problem of Perfect Tire Protection. My "Bricton" Guaranteed Detachable Tread Has Stood the Severest Tests in Actual Use by Thousands of Automobile Owners Under All Sorts of Road Conditions. I Know This to Be a Fact, Because, (1) I Make the "Bricton" Tread in a Manner that Leaves No Question of Doubt As to Its Quality; (2) Hundreds of Users of My Tread All Over the Country Have Assured Me That The "Bricton" is the One and Only REAL Tire Protector.

TO DEALERS

Five years ago, When I Perfected My Tread, I Determined to Sell It Direct to Consumers, So That I Could Trace Results of Each Sale and Know for Myself Just What My Goods Were Doing. The Results of This Direct Selling

Policy Have So Thoroughly Convinced Me of the Practical Perfection of the "Bricton" Tread, That I

Am Now Ready to Place "Bricton" Agencies With Leading Dealers Throughout the Country. Applications Will be Considered in Order of Receipt. Live Dealers, Who Want to Represent the

Only REAL Tire Protector Backed by the Greatest Advertising Campaign Ever Undertaken on a Similar Proposition, Should Get Busy and Wire, Write or Phone for Full Particulars of my Bricton Tread proposition At Once!

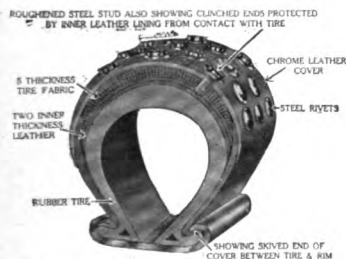
Bricton Detachable Tire Treads

"The Enemy Of Tire Expense"

Consider the following description of how this Tread is made:

First, I use an outer layer of specially tanned, extra pliable, Chrome Leather, which never becomes hard or brittle—never cracks—even when continuously exposed on the tire to all sorts of conditions—water, snow, sleet, dirt, etc. Next to the outer thickness of Chrome Leather are five layers—did you get that, "five layers"?—of the very best quality tire fabric. I might use only three or four layers, and I might use a poorer quality of fabric, but my experience has proved that five layers are necessary to obtain perfect strength and in preventing the tread from stretching.

Next to these five layers of tire fabric is a layer of leather. Please note this: through the outer layer of Chrome Leather, then through the five layers of tire fabric are driven the steel studs and steel rivets. These are clinched into the layer of leather which immediately follows next to the tire fabric, and then there is yet another layer of leather which covers these clinched ends of rivets and studs and prevents them from coming in contact with the rubber tire. Consider, too, the method of fastening the Bricton Guaranteed Tread to the tire. The ends of the outer layer of Chrome Leather are



Cross Section of Bricton Tread

skived or sliced thin where they are placed between the rubber tire and rim. This does away with any possibility of thick ends which might crumple up, and makes possible a snug fit of the Bricton Tread over the rubber tire.

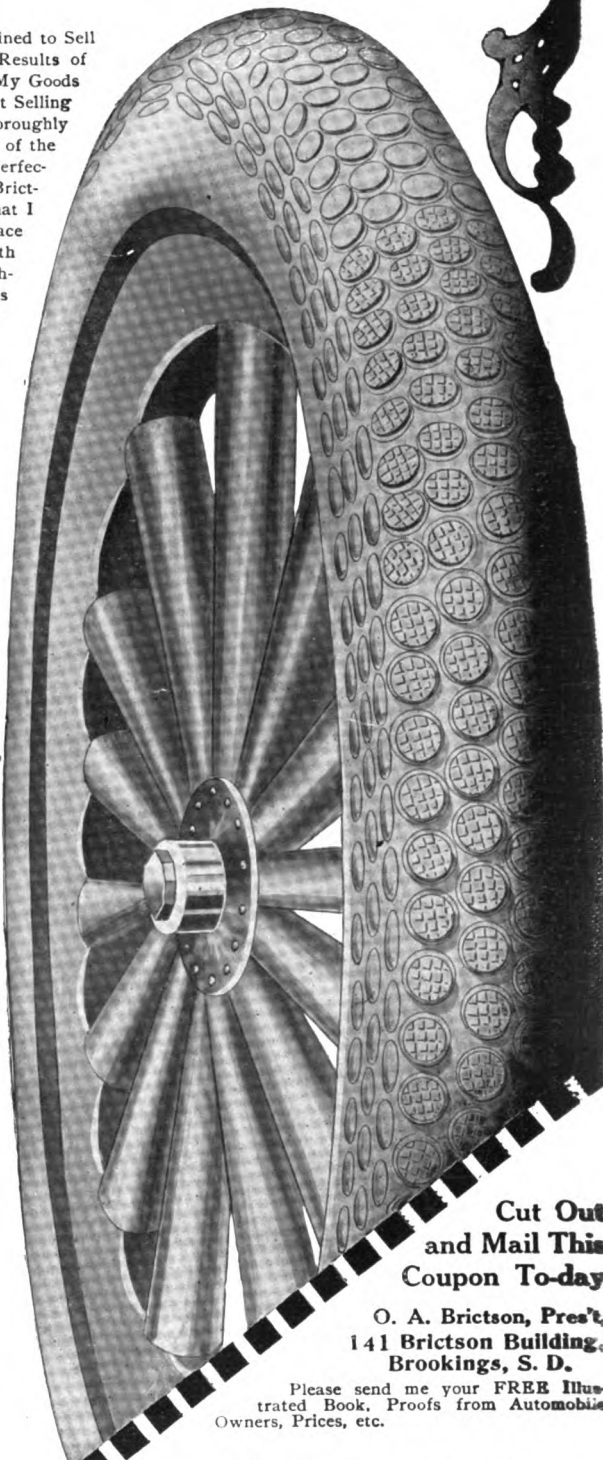
The Tread is slipped in place over the deflated tire and is not held to the tire or the rim by an artificial fastener, such as a hook, or buckle, a wire clasp, or anything of the sort. Air pressure between the tire and rim holds Tread to the tire after it is inflated. It is such construction as this that cuts your tire expense to a minimum.

Ask Your Dealer For Bricton Detachable Tire Treads

Ask the Best Dealer in Your Town to Show You the Famous Bricton Guaranteed Detachable Tread. If, for Any Reason, He Cannot Supply You, Write Me Direct Giving Dealer's Name, and Size of Tire, and I Will Send You FREE, "The Enemy of Tire Expense." Mail Coupon!

O. A. BRICTSON, President

Bricton M'f'g Co., 141 Bricton Bldg., Brookings, S. D.



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and Mail This
Coupon To-day**

**O. A. Bricton, Pres't.
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Brookings, S. D.**

Please send me your FREE Illustrated Book, Proofs from Automobile Owners, Prices, etc.

Size of Tire.....

Name.....

Address.....

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The Solution of the Carbureter Problem—The Only Carbureter Which Carburets

The HOMO was first presented to the automobile public at the Palace Show, December 31, 1909.

Its Success Was Instantaneous!

In a single year eleven thousand cars and boats have been HOMO-equipped.

The demand for a carbureter in which the HOMO would be an integral part, has been so great, that the company has felt obliged to respond to that demand, and is, therefore, marketing the HOMO CARBURETER, which provides *an infinite number of jets* between closed and wide open needle valve, thus giving a different gasoline opening for every position of the throttle

A Jet for Every Position of the Throttle.

The needle valve opening is always in *direct* proportion to the air opening, and this proportioning is easily and simply adjusted by turning a single screw.

The HOMO CARBURETER insures, therefore, a correct proportioning, scientifically, of gasoline and air without recourse to auxiliary air valves with springs, at all points of the throttle, from a walk to sixty miles an hour.

The Greatest Scientific Advance the Gasoline Motor World Has Ever Known

The HOMO CARBURETER is the only carbureter which has the throttle in the right position to properly utilize the vacuum created by the engine during suction stroke. All liquids boil or become gaseous at a high temperature, but when this is done in a vacuum, the boiling point is much lower, and the Evaporation increases.

Vacuum Vaporization.

By creating this vacuum in the carbureter at the proper point—namely: below the point of entrance of the gasoline, the rapidity of Evaporation is increased at low temperatures, so that a low grade gasoline, passing through the needle valve of the HOMO CARBURETER, becomes as easily vaporized as a high grade product. **A 58-test fuel, passing through a HOMO CARBURETER, yields a greater efficiency than any carbureter now on the market will produce from 76-test gasoline.**

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Automobile Dealer and Repairer



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Vol. 11, No. 3.

NEW YORK, MAY, 1911.

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Single Copy, 10 Cents.

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good for the
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is good for the
Dealer—

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Panhard Oil is sold in "Checker Board" Cans and in Barrels.

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Overcome your SPARK PLUG troubles by using MONARCH Spark Plugs.

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"We are sending under separate cover four MONARCH Spark Plugs which have been run over 23,000 miles and have never been taken out. We are sending you these as a souvenir, as we believe this is a record you should be proud of."
(Signed) W. J. WAKEFIELD."

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MONARCH SPARK PLUGS

Dealers, write for our 1911 Prices.

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Little Giant.



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Or are your Customers leaving you?
Have you considered if the tools you have are
doing satisfactory work?

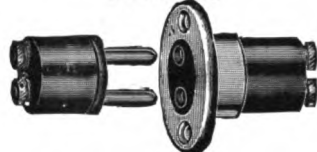
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ASK FOR OUR NEW NO. 30 CATALOG

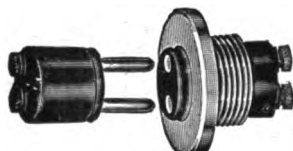
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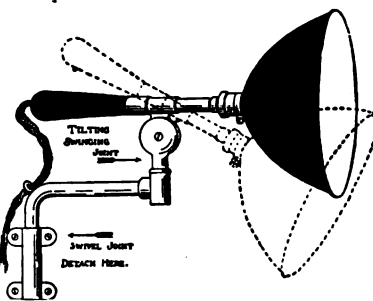
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Primary and
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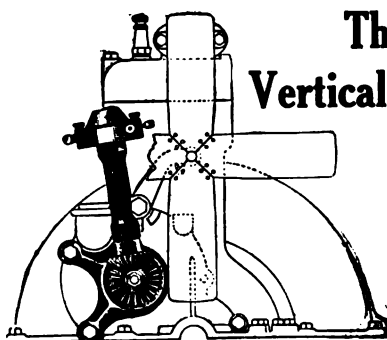
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Style No. 23



The B. M. C. Vertical Timer Bracket

A model especially adapted for
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Ford Motor.

Apply one to your automobile
motor and bring your timer up
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position for cleaning and adjust-
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Machinists and Manufacturers of Automobile Specialties

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HANDLE SOCKET AND
RATCHET WRENCH

The handle will swing
in any position required,
to dodge obstacles, mak-
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places where no other
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Ask your jobber for
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Price, \$2.00 in knock-down form.
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WITHOUT ENGINE OR PROPELLER

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GET IN THE GAME!

AMERICAN RETREADER.

Heating Plant, Boiler and Vulcanizer all in One.

60 Pounds Steam
from Cold Water
Generated in
25 Minutes.

==

No Coal Bin—
No Boiler Room—
No Engineer to
Watch.

==

Costs a Dollar to
Run it for
a Day's Work.

==



Gasoline is the
Fuel.

==

No Condensation
in the Kettle.

==

Handles Any Size
Tire Including
42 inches
Diameter.

==

Always Ready
and Never Fails.

==

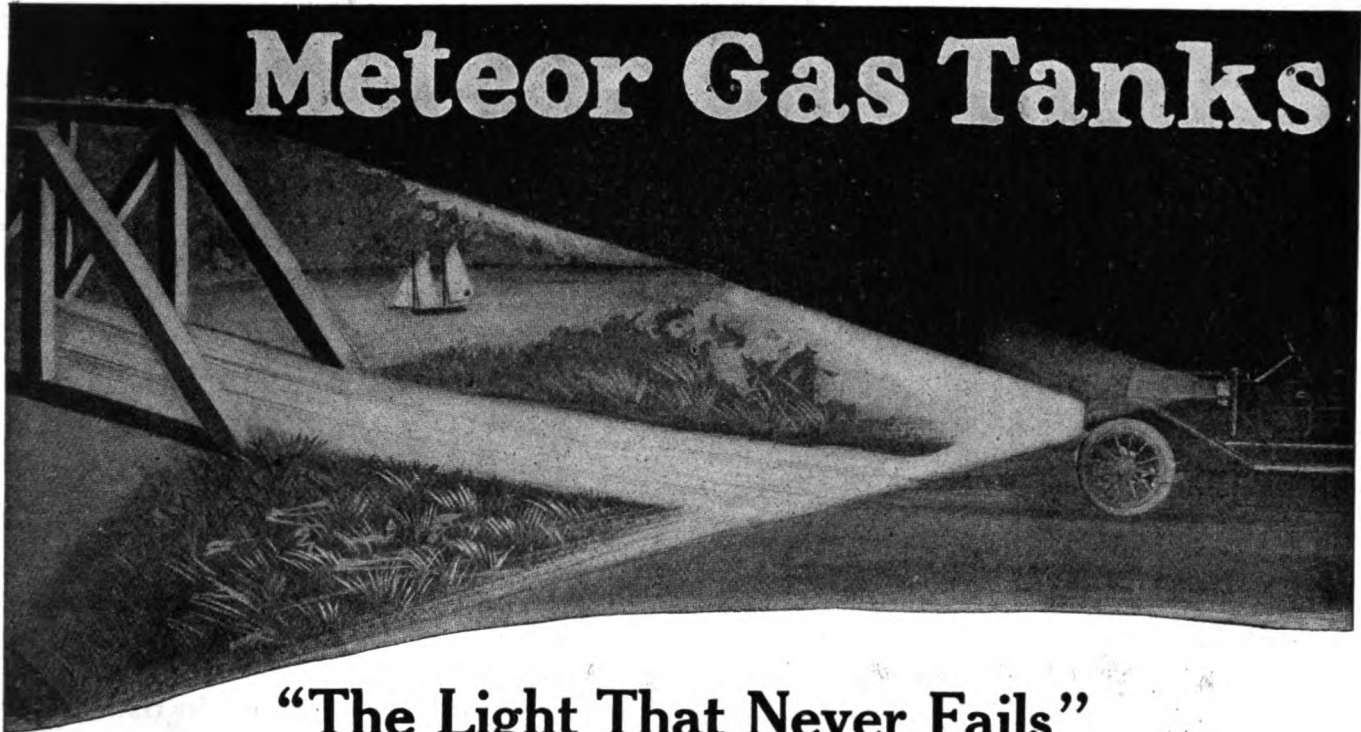
MANUFACTURED BY

THE BAUM IRON COMPANY, Omaha, Neb.

AGENTS: C. J. Smith & Co., St. Paul; Jas. L. Gibney, Philadelphia; Post & Lester, Hartford and Boston; Coughlin & Davis, Cincinnati, Ohio; Alexander Seewald Co., Atlanta, Ga.; Chanslor & Lyon, Los Angeles.

Write direct or to above agents.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



"The Light That Never Fails"

The day of oil lamps and generators is past — the gas tank has become indispensable to the motorist. It is not a "necessary accessory" but an "absolute necessity."

The Meteor Acetylene Gas Tank is the last word in automobile lighting. A perfect, safe, and thoroughly efficient article, producing a superior clear, bright and far reaching light.

An Improved Feature

Meteor Tanks, in addition to the regular equipment of ordinary tanks, have a regulating valve. This valve insures a steady light at all times. Instead of the annoyance at present of adjusting the light at least several times at every lighting, by the use of our regulator the gas may always be turned on full force and the light in the lamps will burn at the exact height required. This results in a saving of time, destruction of lamps, annoyance and waste of gas.

If you see a nickel tank it is a "METEOR." Thousands of these tanks are in use in the Eastern States, and arrangements are being made for the exchange of empty tanks for full ones, throughout the United States and Canada.

For Particulars Write to

METEOR-AUTO-TANK-CO.

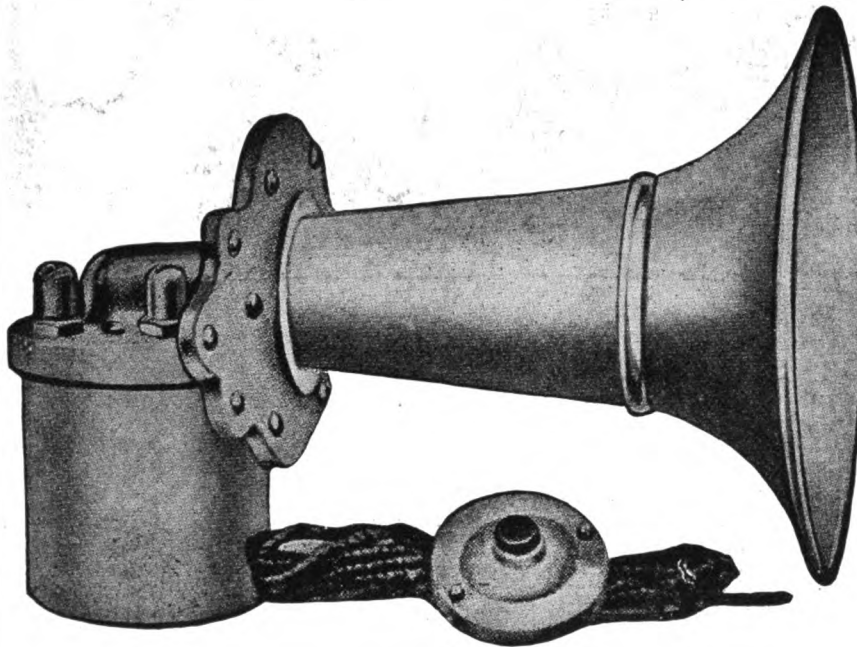
(General Offices) 1666 Broadway, New York City
Factories at Middle Haddam, Conn.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

ANNOUNCEMENT

The Arnold Alarm



THE PERFECT ELECTRIC SIGNAL

For Automobiles

For Motor Boats

HAS the right tone, quality and volume of sound to instantly attract attention. Can be heard for great distances on country roads and above the roar of city traffic. The ARNOLD ALARM is so adjusted that it requires less than one ampere of current; six dry cells will operate it most satisfactorily without renewal for a great length of time.

DEALERS

With your first order for one of each size ARNOLD ALARM we will furnish **FREE** one of the handsome display stands as shown, made of highly polished brass rod, with a handsome dash of metal and wood on which you may mount the ARNOLD ALARMS and attach batteries. Place this stand in a convenient part of your salesrooms and it will demonstrate and sell ARNOLD ALARMS for you. The ARNOLD ALARM is right in tone, quality and quantity, right in price, and is sold under our liberal guarantee.

MANUFACTURED BY

The Standard Electric Works

Dept. S, RACINE, WIS.



You lock your car up at night!

That's a necessary precaution!

But your car is not in half the danger from thieves that it is from faulty lubrication.

When you start out in the morning see that the cylinders, bearings, and gears are properly protected against wear. This you can do by lubricating them with



Keystone Grease is recognized the world over by expert engineers as the standard lubricant for all classes of fine machinery.

Ask any good engineer—he will tell you Keystone Grease is the only perfect lubricant.

Ask Tinius Olsen or Dr. Carpenter, the inventors of the Cornell Testing Machine. They will tell you that with Keystone Grease the friction remains constant, and that the grease maintains its original consistency under high pressure and consequent rise in temperature.

Send for interesting lubricating literature—a liberal education on the subject.

Keystone Lubricating Company PHILADELPHIA, PA.

BRANCH OFFICES AND WAREHOUSES:

NEW YORK 1777 Broadway
CHICAGO 2123 Michigan Ave.
NEW ORLEANS 610-12 Chartres St.
LOS ANGELES 1607 S. Flower St.
BOSTON 284-290 Franklin St.
COLUMBUS, O. 542 Vermont Place

DENVER 1st National Bank Building
SAN FRANCISCO 288 Market St.
PHILA. STORE, Auto Dept., 1327 Race St.
MINNEAPOLIS, 902 Lumber Exchange Bldg.
JOPLIN 2131 Sergeant Ave.
KNOXVILLE, TENN. 707 W. 5th Ave.

A Kentuckian from Missouri

Louisville, Ky.

Keystone Grease and Keystone Motor Oil are both giving perfect satisfaction, and if there is anything better on the market, "they will have to show me."

THOMAS AUTOMOBILE CO.,
By W. A. Thomas.

Keystone Motor Oil

Keystone Motor Oil is a cylinder oil of the same high standard as Keystone Grease. It maintains a satisfactory lubricating body at the severest working temperatures.

Keystone Grease and Motor Oil can be bought from all dealers and garages, or direct from any of our branch offices.

Our Guarantee

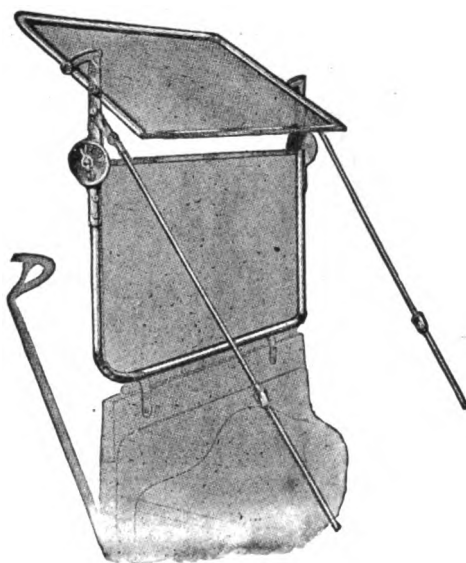
One pound of Keystone Grease is equal to three or four pounds of any other grease or lubricating compound—or four to six gallons of any bearing oil.

VASCO

Wind Shields

Make Satisfied Customers

*Because of its Convenience, Durability, Elegance
of Appearance and Practical General Utility*



Position for rain, snow and sleet. You see
the road between the sashes.

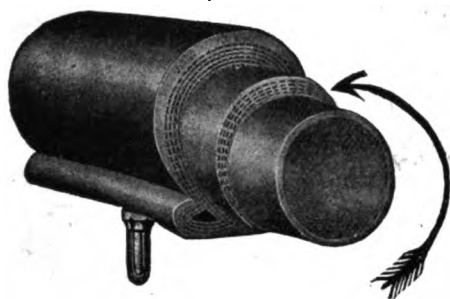
DEALERS AND AGENTS

The demand for "VASCO" Shields has been established and is increasing rapidly, owing to the extensive advertising campaigns which have been inaugurated and the unprecedented values offered. Prices have been reduced to the lowest possible basis consistent with superior construction and material. Our agency proposition is exceptional. Write for it now, as your territory may still be unallotted, and we want you to participate with our other dealers in the business resulting from our campaign. Do not delay but write today.

Victor Auto Supply Manufacturing Co., Inc.

35 West 43d Street

New York City

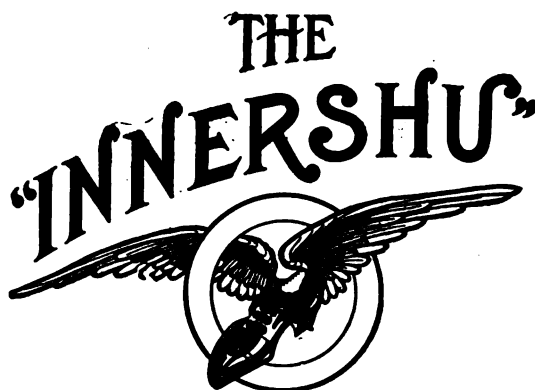


Made of [Bullet - Proof

Sea Island Cotton Fabric, formed and stretched by our special secret process to exactly fit a tire so as to relieve it from all strain from within. Protects the tube. **DOUBLES** tire mileage. Is blow-out and puncture proof.

Easily placed and out of sight. Insures 75 per cent. decrease in tire troubles and expense.

**INSIST ON THIS
LABEL**



LABEL COPYRIGHT 1908
BY INNER SHOE TIRE CO.

PROTECTS Against Imitations

INSURES the Original and Only

"INNERSHU"

GIVES An Absolute GUARANTEE

To Produce Satisfactory Results

ASK YOUR DEALER

OR WRITE

INNER SHOE TIRE COMPANY

Grand Rapids, Mich.

U. S. A.

Will you spend
a minute a day to
double the life
of your tires ?

Practically without effort, and with only a minute's time daily, you can get \$2 in tire **service** for every \$1 you pay for tires. Read about



MOORE TIRE SAVING JACKS

They take **all** weight **off** the tires.

Over **half** the life of your tires is spent **at rest**. Standing still as well as running they are **working**—supporting a load—wearing out. You can **save** this wear for the 8 to 14 hours a day your car is **at rest**, by jacking it up every night—only 30 seconds' work with a set of Moore Tire Saving Jacks.

The picture tells the whole story—just slip the loop over the hub and push down lever. The leverage is so great a man or boy can **easily** jack up the **heaviest** car. Leather pad on ring prevents marring hub. Once adjusted for your car they need never be changed.

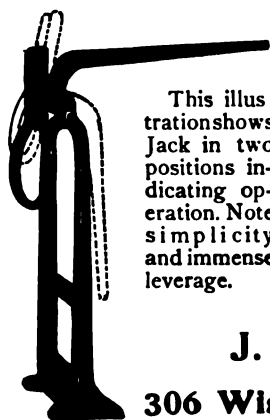
A set of four Moore Tire Saving Jacks costs only \$6.50 at your supply dealer's, or will be sent direct from the factory to you upon receipt of price. Carrying charges prepaid East of Rocky Mountains. Money back if you are not satisfied. If you "care a hang" for tire expense—if you want to **double** the life of your tires—these jacks are worth many times their cost to you. There is nothing more to tell. Make up your mind **now** to order a set and clip the coupon as a reminder.

**As a Reminder
tear off this
Coupon
NOW**

J. C. MOORE & COMPANY, 306 Wisconsin Street, Racine, Wis.

For the enclosed \$6.50 please send me one set of four Moore Tire Saving Jacks (carrying charges prepaid East of Rocky Mountains), upon condition that you will refund my money in full if not satisfactory to me.

Name.....
Address.....
Make of Car.....



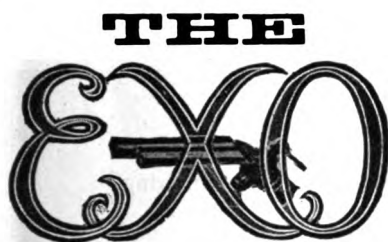
This illustration shows Jack in two positions indicating operation. Note simplicity and immense leverage.

Dealers

To any **responsible** dealer in motor car supplies we would like to submit a proposition whereby we **both** may make **more** money. Ask us on your business letter-head.

J. C. MOORE & COMPANY
306 Wisconsin Street, Racine, Wis.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



WARNING SIGNAL

**LOUD WITHOUT HARSHNESS
LITTLE IN PRICE
BIG IN TONE**

Can be heard a mile away.

For City — — courteous
For Touring — penetrating

{ Commanding
immediate
attention

Can be toned down to meet the requirements of city driving.

It is easily attached to the exhaust pipe of the engine and once installed it can never break, clog up or wear out.

Exo is indestructible and it will outlast all of the cars you may buy in course of a lifetime.



Exo operates from the exhaust of the engine and requires no expensive batteries, coils, armatures or diaphragms. Its operation is purely mechanical, and its note, while powerful, is not strident or harsh.

**All Sizes over 30 horse-power, \$7 ;
30 horse-power and under, \$5.**

In ordering give the make, model and year of your car. Send for an Exo to-day. Try it on your car for 30 days and if dissatisfied return the instrument and we will cheerfully refund your money.

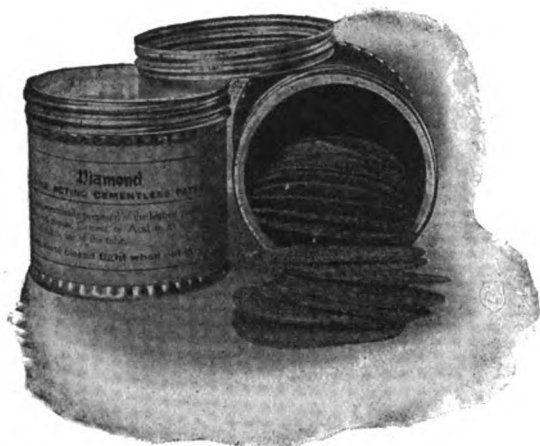
Exo is for sale by all first-class dealers or by us direct. Order to-day.

Troy Auto Specialty Company

TROY, N. Y.

New York Office and Salesroom, 1976 Broadway

Diamond Cementless Patch



Probably you have impatiently waited at the roadside for cement to dry in repairing a puncture.

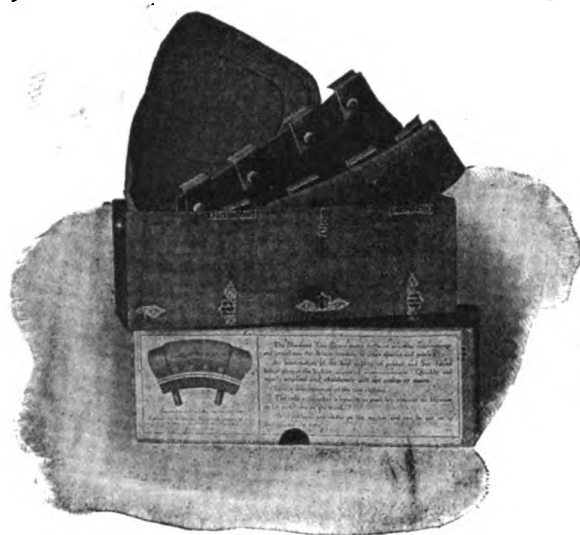
You missed the train or lost that contract?

Diamond Cementless Patches do away with delays. You simply clean puncture thoroughly, apply patch, insert and inflate tube and go ahead.

The heat engendered by running the tire securely vulcanizes the patch, making it a durable, efficient repair.

Satisfaction guaranteed if used as directed.

Diamond Tire Sleeve



Ever require a new casing when you had none? Some large injury—a bad cut, say?

The Diamond Tire Sleeve will enable you to continue your trip. Protects *any* injury under the length of the sleeve which averages, according to your tire cross sectional size, from 5 ½ inches to 9 ½ inches.

Fits under the rim and holds a rim cut as effectively as a puncture on the tread.

Applied in from 3 to 5 minutes. Will not creep or move.

A fabric patch to protect the inner tube accompanies each Diamond Tire Sleeve.

Diamond Repair Material



For the car owner equipped to make his own repairs—or dealers using small quantities—these materials are especially recommended. Best quality. Put up in one-pound, air-tight cartons that prevent drying out.

Particularly well adapted for use with "Stitch-in-Time" or Portable Electric Vulcanizer.

THE DIAMOND RUBBER CO., Akron, O.

Sales Houses and Service Stations in 54 principal cities, covering all sections.



“Keep your imitations for folks that haven't been through the mill.”

“Give me the genuine Prest-O-Lite!”

“I had an imitation once. The dealer said it ‘held more gas,’ ‘cost less,’ etc. Maybe he believed it, too—I did, for a while. I got poor gas and less gas.

“One night my tank ran low. I ran into a little town and tried to exchange my empty tank for a full one. Nothing doing! The Prest-O-Lite Co. had its agent there—there's one in nearly every village in the country—to give service to Prest-O-Lite users.

“But, you see, I didn't have a Prest-O-Lite Tank. I had this ‘maybe-it-holds-more-gas’ affair, and there was no place where I could exchange it for a full tank. Never again!

“Not long after that, the makers of that imitation got tired of the business and quit. There tanks were then worthless because they could neither be sold nor re-filled.

“No more counterfeits for me!”

And, Mr. Dealer, are you playing a good game when you buy and sell imitations?

You know that no imitation gives or can give the exchange service that the Prest-O-Lite Tank does. And if your customer doesn't know it, he'll quickly find it out. Whom will be hold responsible? YOU!

You know that no imitator can duplicate Prest-O-Lite Service until he duplicates the world-wide Prest-O-Lite organization. It took the Prest-O-Lite people over 6 years to perfect that organization. To create its equal, (even if it were possible) under present conditions, would take 20 years. In the meantime, hadn't you better let the imitator experiment with his own money, and not with *yours*?

The Prest-O-Lite Co., 251 East South Street, INDIANAPOLIS, IND.

Branches at Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Jacksonville, Kansas City, Los Angeles, Milwaukee, Minneapolis, New York, Omaha, Philadelphia, Pittsburgh, Providence, St. Louis, St. Paul, San Francisco, Seattle.

Charging Plants: Atlanta, Cleveland, Dallas, E. Cambridge, Hawthorne, Indianapolis, Long Island City, Los Angeles, Oakland, Omaha and Seattle.

Foreign Agencies: Honolulu, H. I.; Manila, P. I.; San Juan, P. R.; Toronto, Can.; Vancouver, B. C.; Havana, Cuba; City of Mexico; London, Eng.; Berlin, Germany.

Exchange Agencies Everywhere

Please mention the Automobile Dealer and Repairer when writing to advertisers.

"I TOLD YOU SO"

A Statement to Enable Us to Refer to This Announcement Six Months Hence

Within six months we shall refer in our advertisements to the facts that are presented in this announcement.

It might be well for you to read them, so that you will know when our big advertising is started, just what we are doing.

The "survival of the fittest"—the "big change"—"conditions are not as they were" has been dinned into your ears for the last eighteen months. You can see that this change is taking place but do you realize in just what manner it is coming out?

In the most prosperous times this industry has known—that is, during those times when the demand far exceeded the supply and when people were buying anything that had wheels and a motor, without much regard as to its quality, companies failed.

Statistics show that 93 per cent of all business failures are due to incompetency, or lack of capital. Incompetency leads as a cause of business ruin. In every industry such a change is constantly occurring.

In 1909, 446 clothing manufacturers, with liabilities amounting to \$4,826,047, failed. Yet the gross sales of clothing that year were greater than ever.

The cause for this is simple. Those firms which were led by brains, experience and ability, won. In business warfare it is a fight of wits, and the one who is most thoroughly equipped in these respects gets the prize. That explains what is causing the "survival of the fittest" in the automobile industry.

Within six months we shall again call your attention to what the HUDSON is doing as a leader in the industry. Note now what is doing for those dealers who are fortunate enough to have it in their territory.

The Dunlap hat agency sold in St. Louis for \$20,000. It was a franchise for which the new dealer was willing to pay in order to obtain the right to sell Dunlap hats.

Premiums for desirable lines will be paid in the automobile industry. All we ask is that you watch the HUDSON. See what it does this summer. If its success assures you that the Company is manned in such a way as to insure continued prosperity and feel that you would like to hitch your wagon to the HUDSON star, then read our next advertisement. Change is an immutable law of nature. Perhaps there may some time be an opportunity for you to be one of us.

HUDSON

MOTOR CAR CO.

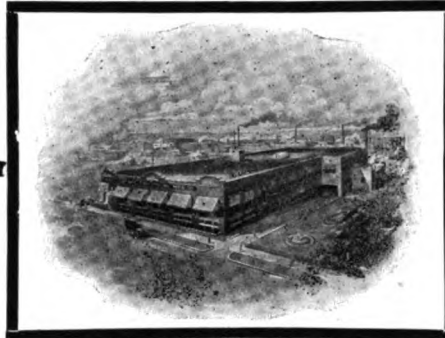
6075 Jefferson Ave., Detroit, Michigan.

GARAGE EQUIPMENT MFG. CO.

746 So. Pierce Street, Milwaukee, Wis.

Write for Our Catalogue

Our New Factory—
The largest of its kind devoted exclusively to the manufacture of automobile accessories.



All our products are high grade in quality, workmanship and finish and you will find them saleable and profitable.

"Superior" Grip Tire Chains

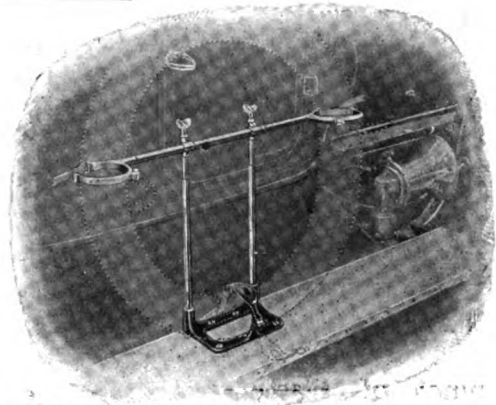


Do not confuse our chain with the ordinary chain with which the trade is familiar and which usually wears out in about thirty days if used on hard pavements. "Superior Grips" are superior to all others. They are SPECIAL HARDENED and will stand rough, hard usage.

Insist upon getting "SUPERIOR GRIPS" in light gray sacks.

FORE-DOOR Tire and Demountable Rim Holders.

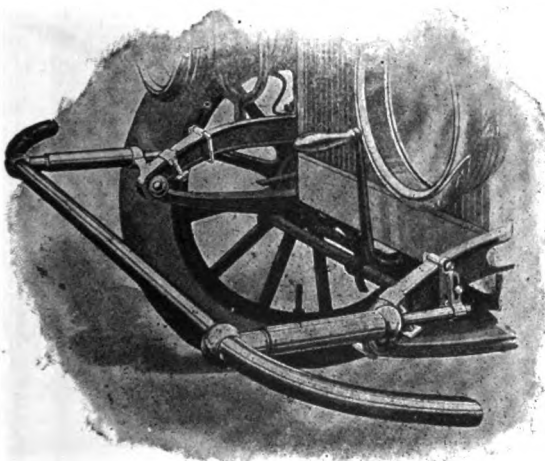
Fills a Long Felt Want.



Contained entirely on the running board. Therefore it is unnecessary to drill holes or otherwise disfigure the body of the car. Can be adjusted to fit any sized tire. Finished in brass or nickel. Made in two sizes.

"Protect your Lamps and Radiator."

The "UNIVERSAL" BUMPER



Will fit any car without drilling holes or removing bolts. Simply clamps to the frame. Strong, serviceable, ornamental. Finished in black, nickel or brass.

MILWAUKEE "TORPEDO" WIND SHIELD

Our Latest.

Imported Plate Glass.
—
Adjustable Brace Rods allow it to be laid over hood when not in use.
—
Clear Vision.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

3 valuable Short Cuts for Emergencies

**Each of Goodrich Quality
and precision of manufacture
and each a prime necessity
for every Garage and every
Automobile Owner.**

Goodrich Plastic

Many a good tire is lost through neglected cuts or gouges in the tread. Whenever a cut extends to the fabric your tire is hurt "to the quick."

Moisture and dirt penetrating through even an inconspicuous cut, will creep along the stoutest fabric, like oil in a wick, and soon disintegrate it — perhaps a foot or more away from the cut.

A pinch of Plastic prevents the small Sand Blisters, which mean Big Blow-Outs.

Wash out and thoroughly dry the cut. Then apply Plastic. It "stays put."

In small cans containing two ounces. Price 50 cents

Goodrich Protection Patch

Designed in particular to accompany and make doubly effective the Goodrich Emergency Band, but can be employed separately to good account.

Fitted against the inside of the case at the point of rupture and prevents the inner tube from working into the break, and the resultant injury that is bound to come from pinching.

The Goodrich Emergency Band and the Goodrich Inside Protection Patch constitute a handy repair of aids that no tire user should ever be without.

Goodrich Emergency Band

A piece of good rubber and fabric shaped to fit snugly against the tire and around the rim and held in place by means of cord laced through the eyelets of the band and around the felloe of the wheel.

It makes a temporary but effective repair of any break or cut in the tire.

Easily and quickly applied and stays put. The cost is trifling; the saving may be immense.

THE B. F. GOODRICH COMPANY

AKRON, OHIO

Largest in the World

**Branches in the
Principal Cities**

**Wholesale Tire
Depots Everywhere**

Please mention the Automobile Dealer and Repairer when writing to advertisers.

SPECIAL NOTICE

CONCERNING

K & W PATENT RELINERS

To Consumers, Dealers, Jobbers and Tire Repair People.



Reg. Applied For.
Above shows K & W Reliners strengthen tires so much that they may be worn entirely through without having blow-outs.

The K & W Patent Reliner

was "the first successful reliner" ever manufactured, and is, and always has been, made of a better quality of material than any imitation or infringement.

Remember, The K & W Patent Reliner is Fully Guaranteed.

TIRE REPAIR PEOPLE everywhere are using K & W Patent Reliners in their repair work, which proves they are a good thing to strengthen weak tires.

We guarantee K & W Patent Reliners to eliminate your tire trouble and tire expense and agree to refund money if reliners are not satisfactory in every way.

You might be surprised to know that there are nearly 15,000 K & W Patent Reliners in successful use at the present time.

Eventually, K & W Patent Reliners will be used by all auto owners as a means of preventing tire trouble and reducing tire expense.

**Be sure you get a K & W
IT'S BEST.**

For sale by nearly all dealers, jobbers and tire repair companies. If your dealer does not have them, write us **AT ONCE** for our Proposition on a Trial Order.

K & W MFG. CO., 3rd St., Ashland, Ohio.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

As manufacturers of K & W Patent Reliners, which are sometimes called Inner-Shoes, Inside Tire Protectors, Inner-Tires or Tire Reinforcements, we are pleased to advise you that we own, **EXCLUSIVELY**, patents which are basic and which cover the reliner thoroughly. What the **SELDEN PATENT** is to the gasoline automobile—our patents are to the successful inside tire protectors.

No doubt you are aware that there are several imitations and infringements on the market, the manufacturers of which claim to have "something just as good." Our reliners are semi-cured; a feature which is covered by patents. Under-cured reliners tend to become cured by the heat generated by the friction of the tire on the road, while full cured reliners would become over-cured and deteriorate rapidly. This is why **semi-cured** reliners remain soft and pliable and are of long life.

The K & W Patent Reliner is coated with a vulcanizing compound which causes it to adhere firmly to inner walls of tire. Thus, it will not creep or generate heat by its use. This feature is **also** patented. Patents "also" cover coating inside of tire with a vulcanizing compound before applying Reliner.

Therefore, when anyone offers you a semi-cured or cement coated reliner by whatever name called, they are imitators or infringers unless the following dates of patents are stamped on inside of reliner:—"Dec. 28th, 1909, and Jan. 4th, 1910." Evidence is being secured against infringers and prosecutions will follow.

Why should you purchase these imitations and infringements when you can purchase the original "patented" reliner at no greater cost?



Reg. Applied For.
These Tires can be seen at our Office.

FOR LIVE AGENTS AND DEALERS

Here's an opportunity to take on a quick-selling, satisfaction-giving line, the "UNIVERSAL" adjustable and detachable full tread and the "UNIVERSAL" emergency tire sleeve. Time-tried and proven successes.

How many machines are there in your immediate vicinity? You perhaps haven't an idea. Just make an estimate and then multiply it by four, (four treads to the car,) how many protectors are needed? Pretty likely prospect for business, isn't it? Of course you can't sell them all, but they're potential customers, and you'll get a good proportion. And if the full tread won't interest them all, the "UNIVERSAL" emergency

tire sleeve will. Every autoist must have a repair boot of some description. How many of your friends, or how many autoists that you know, have a really practical and efficient repair boot? The "UNIVERSAL" emergency tire sleeve is the one sleeve that deserves the name of a quick-repair-patch. It is far and away the best thing of the kind on the market. No lacing. It's adjusted in an instant and drawn to the proper tension with the little wrench. And it stays where it's put. It simply can't get away.

Think this over. Give it your earnest consideration. A canvass of the tire situation shows no likelihood of an improvement on the pneumatic tire. The unsuccessful experiments of the past and the to-be-looked-for unsuccessful experiments of the future in seeking a substitute for the pneumatic tire, one that possesses all its virtues with



"UNIVERSAL" TREADS WARRANTED FOR 5000 MILES

OUR SIGNED CERTIFICATE COVERING THIS WARRANTY WITH EVERY TREAD



none of its weaknesses, acknowledge that an efficient tire protector is the solution of the tire problem as it stands today.

The tire protector is a live proposition. IT HAS ARRIVED. It is a business that is growing by leaps and bounds, and the man who interests himself with us now in the sale of the "UNIVERSAL" will profit correspondingly. One "UNIVERSAL" agent last year sold \$20,000.00 worth of treads.

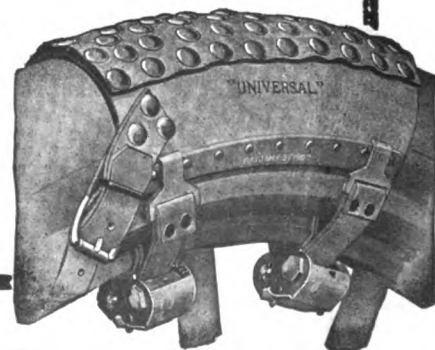
The "UNIVERSAL" has been pronounced, by a canvass among the experienced, THE STANDARD OF TIRE PROTECTORS, THE PROTECTOR TO BUY. The phenomenal service given by the "UNIVERSAL" now justifies us in making a mileage guarantee. We guarantee 5000 miles. And we believe that we are the only manufacturers making such a guar-

antee or that could consistently do so. The "UNIVERSAL" agency is an acknowledged asset. If it's valuable to others, it is to you. The live agent and dealer cannot consistently neglect to consider our proposition. We supply necessary printed matter for your distribution and give you an attractive enamel sign, white letters on blue background, for window display. Write right now, today, for our proposition and booklet, "TIRES THAT NEVER TIRE," fully describing and listing the "UNIVERSAL" line.

"UNIVERSAL" TIRE PROTECTOR CO.,

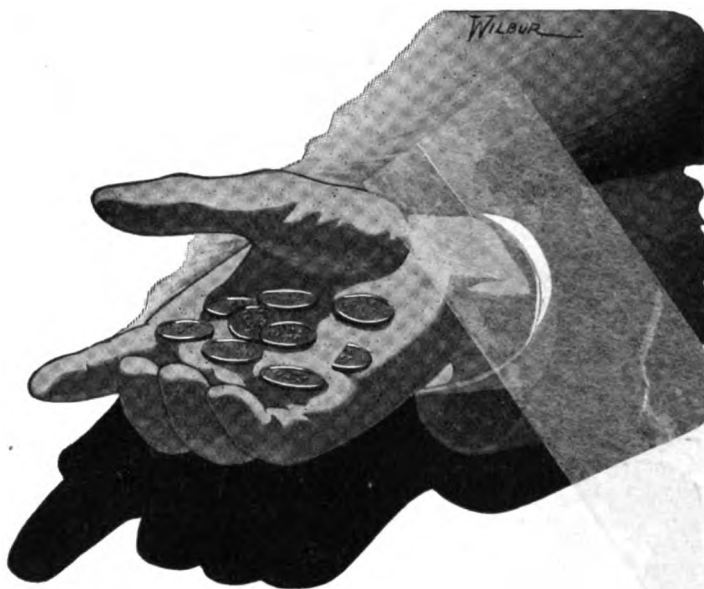
Lock Box 678 D,

ANGOLA, INDIANA, U. S. A.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

8½ cents a month
pays for the only
easy working,
98% efficient
tire pump—the



Pitner Pump

Price \$5 and *guaranteed* for five years' service means \$1 a year—8½ cents a month. It can't cost you more.

How much will any other tire pump cost you *by the month*? How long will any other tire pump *last* and *satisfy* you by doing its work *well*? Nobody knows well enough to guarantee it—or maybe they know *too* well. Anyway, the Pitner is the *only* pump that is *guaranteed* for five years' service.

8½ cents a month. That is *all* it costs to be *sure* you'll *never* have to run on a flat tire—if you carry a Pitner Pump. And you can't be sure with *any other* pump. The Pitner is the *only means* of inflating

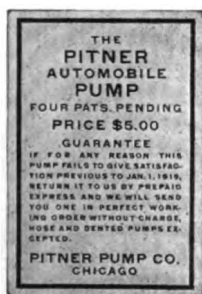
tires that is *always dependable* any time and any place—the *only* tire pump *guaranteed* for five years' service.

8½ cents a month is pretty cheap tire insurance. Read our guaranty plate attached to every pump.

Some day on the road you may pay dearly, in tires, for *want* of a dependable pump—unless you clip the coupon below as a *reminder* to see your dealer about the Pitner Pump. For *quick action* telephone him now. Then if he can't supply you, send us his name and \$5 and *we* will ship you a Pitner Pump *express prepaid*. Money back if you ask it. So

Clip this coupon NOW

The Pitner Guarantee



Here is a photograph of our guarantee and name plate attached to every pump. Two or three times a year we change the date on it so that every purchaser is guaranteed satisfaction for full 5 years.

Pitner Pump Co., 18 West Michigan St., Chicago, Ill.

Pitner Pump Co., 18 W. Michigan St., Chicago

Gentlemen:—My dealer whose name and address are

Dealer's

Name.....

Dealer's

Address.....

says he is not prepared to deliver me a Pitner Pump. For the enclosed \$5.00 { draft } { please ship me one express } { check } { money order } prepaid upon condition that you will return my money in full if pump is returned to you within 15 days from this date.

My Name.....

My Address.....

If before ordering you want our interesting free booklet that explains all pumps, just send us this coupon without the \$5.00.

Worn-Out Tires Made New

Your old tires which you are about to discard can be made like new at a low cost. Don't throw them away—don't have them vulcanized—don't buy new ones

Our Exclusive Process Makes Your Old Tires Puncture and Skid Proof

Hundreds of motorists are getting thousands of extra miles out of old tires which they formerly threw away. Our

TRIPLE TREAD PROCESS

MAKES OLD TIRES LIKE NEW



Before
Treating

We use this old casing as a foundation upon which to build, covering it entirely with tough, wear-resisting, waterproof, French Chrome leather, giving you a tire that is like new, and one that will often run from two to three thousand miles further than this same new tire would run. This has been demonstrated time and again.

Where the greatest wear comes there are three thicknesses of this leather. The outer ply is brought down the sides of the casing far enough to give ample protection to the sides of the case against rut wear; the second ply is brought down the sides of the case over the bead, being skived (tapered down) at the edge so that it does not in the least interfere with replacing the tire on the rim. This gives added strength to the sides of the case and protects it at the point of contact with the rim so that rim-cutting is practically impossible. The third ply takes the place of the old rubber that is removed from the case before the Triple Tread is applied.

In addition to the steel studs on the tread, there are from one to three rows of flat-headed steel rivets extending down the sides of the case as far as the outer ply comes, which gives an additional protection to this part of the case against rut wear. The steel studs in the tread and the side rivets fasten the different plies of leather securely together.

The Triple Tread is put in place and made to fit perfectly over every square inch of surface, so that when the process is completed the Triple Tread is actually a part of the old casing, the plies of leather, rubber and fabric being inseparately united.

An old tire Triple Treaded is actually better than a new rubber tire for the following reasons:

It makes your tires absolutely PUNCTURE-PROOF.

It makes your tires as nearly SKID-PROOF as anything can possibly be made—doing away with the use of chains at all times for the reason that our studded tread affords more traction than a chain.

It reduces the possibility of a blow-out to the minimum.

The Triple Treaded tire is as smooth and slightly in appearance as a new tire. It has none of the ragged edges or scalloped projections found on leather covers and detachable treads.

The Triple Tread, being actually made a part of the casing, cannot creep or become loosened and for this reason no more heat will develop than would be the case with an ordinary rubber tire.



After
Treating

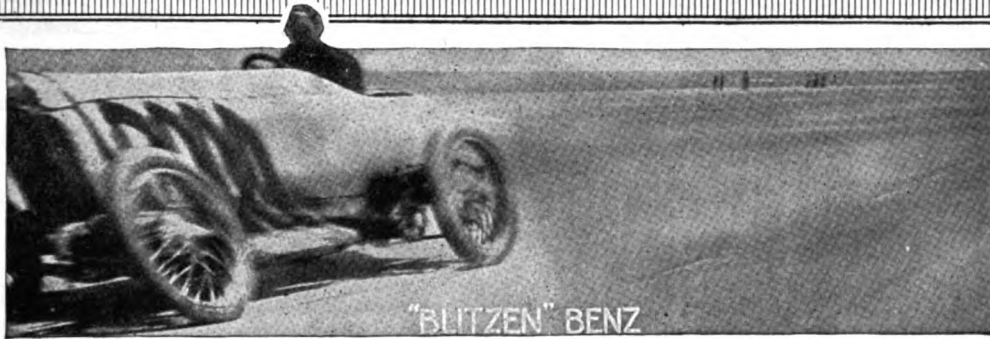
Every Triple Tread is Guaranteed Perfect in Material and Workmanship

TRIPLE TREAD MANUFACTURING CO.

1542 Michigan Avenue, Chicago, Ill.

542 Van Ness Avenue, San Francisco

52 Gertie Street, Winnipeg, Manitoba, Canada



"BLITZEN" BENZ

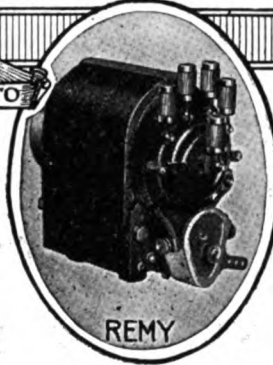
THE CAR



"BOB" BURMAN

THE DRIVER

THE MAGNETO



REMY

THE RECORDS

Kilometer, 15.88 Seconds—140.78 Miles Per Hour
One Mile, 25.40 Seconds—141.73 Miles Per Hour
Two Miles, 51.28 Seconds—140.40 Miles Per Hour

Established by the world's greatest driver in the world's greatest motor car, equipped with the world's greatest magneto, on Daytona, Fla., Beach, April 23, in Official Record Trials

200 Horse Power Blitzen Benz, after one year of terrific racing service, lowers by many seconds its own records made on the same course in March, 1910. The only change in car was the replacement of two magnetos of other makes by one Remy Magneto.

After the sensational victory, the Benz Import Company of America wired us as follows:

"Accept our congratulations on wonderful performance of your Remy Magneto on Benz car. It proves conclusively your ignition is absolutely perfect and of highest efficiency."

There can be no greater proof that the gruelling speed demonstrated beyond question Remy Ignition superiority.

Your Remy Magneto is of the same materials, the same construction, the same design, renders the same unfaltering service of the Remy which Burman used on his world's record Benz.

With Remy equipment you get the BEST ignition there is. You get it at a cost that shares with you the economies of our large productions. And you get the advantage of Constant Service from the world's largest magneto factory and organization.

Specify Remy Magneto Equipment on Your Car

Remy Electric Company



FACTORIES - ANDERSON, INDIANA - GEN'L OFFICES
NEW YORK - BOSTON - DETROIT - CHICAGO
KANSAS CITY - SAN FRANCISCO





When you want to go in the opposite direction you don't walk backwards. You turn round, your feet acting as a kind of turntable.

When you want to get your car out of the garage, it's neither safe to the car or passerby, nor convenient to yourself, to back out—it's far safer and more convenient to turn the car round on a turntable and drive out the right way. A

LANSING TURNTABLE

is easily installed, either inside your garage or just in front of it; makes an admirable wash stand for your car; is very easy to operate; will last a lifetime; will save its cost by saving the cost of accidents and of injury to your car, and can be furnished in any size you want.

Let us send you our "Talks on Turntables," which illustrates and describes the Lansing Turntable. Write today for catalog "M."

Lansing Wheelbarrow Company, Lansing, Michigan



**Drive
Out-
Not
Back
Out**



ZIMMERMAN INNER TIRES

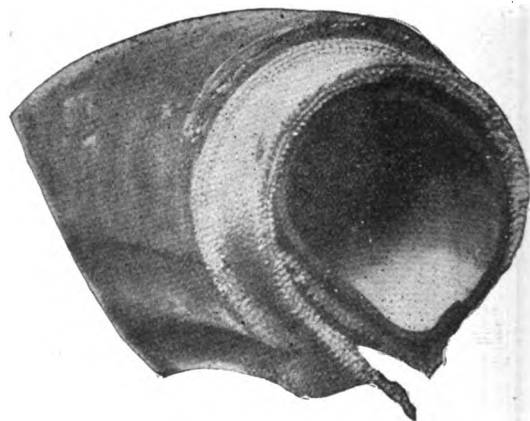
AND OTHER SPECIALTIES.

NEW PRICES.



What We Make :

INNER TIRES,
OUTSIDE LACE
BOOTS,
BLOWOUT SLEEVES,
TUBE REPAIR KITS,
CASINGS AND
TUBES
RAW MATERIALS
FOR REPAIR WORK,
BICYCLE AND
MOTOR CYCLE
TIRES,
MECHANICAL
RUBBER GOODS,
STEAM BOILERS,
REPAIR
VULCANIZERS,
KETTLE
VULCANIZERS.



We make Inner Liners with or without the Interlocking Flap, Endless or with the two ends. Any weight fabric or number of plies.

We Claim One of the Largest Repair Departments in the United States.

WRITE TO US TO-DAY FOR OUR SPECIAL PRICES.

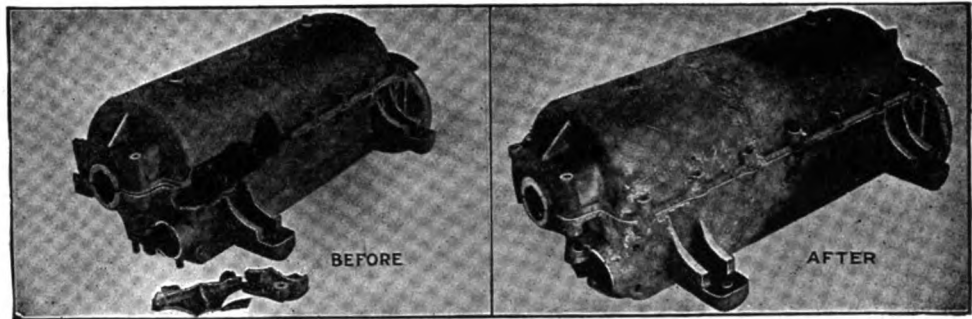
Special Proposition to Jobbers and Dealers.

ZIMMERMAN RUBBER CO., Alexandria, Ind.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

BUSTED?

We Weld all
Metals,
Cast Iron, Steel,
Aluminum, Bronze,
Malleable Iron.



OUR WORK IS GUARANTEED.

You take no risk in sending your work to us, no charge if not successful.

Frozen Cylinders and Broken Aluminum Cases a Specialty

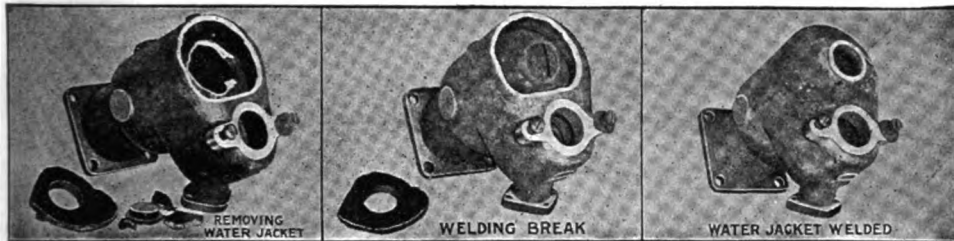
SPECIAL DISCOUNT TO THE TRADE

THREE YEARS' EXPERIENCE

THREE PLANTS

Davis Bournonville
Oxy-Acetylene Welding
Plants Supplied

"THE WELDING"
COMPANY
TRADE MARK



45 Bay Street,
SPRINGFIELD, MASS.
63 Southampton Street,
BOSTON, MASS.
38 Elm Street,
HARTFORD, CT.

40% PROFIT ON EVERY DOLLAR YOU INVEST

This Can Be Realized in Operating a

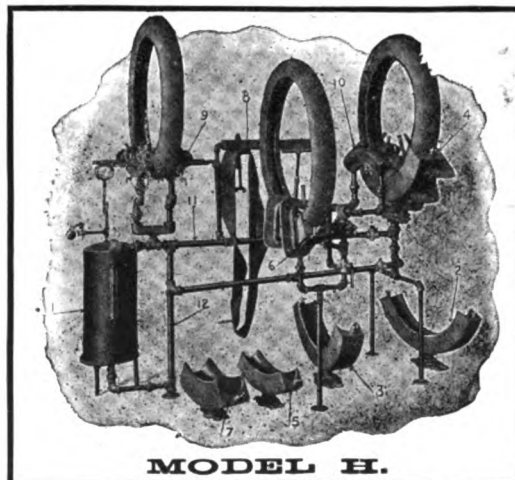
MARBLE-HAYWOOD

Do Your Other Departments Pay As Well?

The time has come
when inferior
methods and machinery
MUST be abandoned.

The PROFIT is now
going to those equipped
to do satisfactory work
at a minimum price.

**ARE YOU GETTING
THIS PROFIT?**



Model H is the garage
man's plant and enables
him to do ALL tire re-
pair work—RETREAD-
ING—SECTIONAL—
TUBES—without the
expense of a large boiler
and the loss of floor space.

Send for catalog
and proof of the
40% profit.

HAYWOOD TIRE & EQUIPMENT CO., 528 N. Capitol Avenue,
Indianapolis, Indiana.

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DEMAND

the best quality, insist on
your supply house furnishing

Goodell-Pratt's Punches

You get the benefit of our years of
experience which have taught us just what
grade of steel and just what method of
tempering give the best results.

We make 30 styles and sizes of points,
surely you will find what you need.

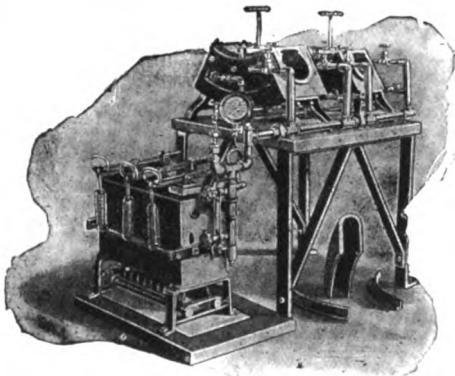
Goodell-Pratt Company

Toolsmiths

GREENFIELD, MASS., U. S. A.



MAKE MONEY REPAIRING TIRES



COMPLETE OUTFIT. STEAM GENERATED
BY GASOLINE OR GAS.
WE HAVE OTHER STYLES.

either as part of a garage and general repair business or as a separate venture. Requires very little capital to equip a shop completely with the best tire repairing outfit in the world. The equipment can be paid for and a good profit made by the first season's work. Every motorist must have tires repaired—every motorist in your vicinity is a possible customer for tire repairing.

Get the right kind of equipment—one that produces work that you can guarantee—the Akron-Williams Tire Repair Equipment which was designed by practical tire factory repairman.

Localized heat is the secret of the Akron-Williams. Three separate steam chambers in each of our sections, our exclusive patented feature, limit the curing process to the repaired part.

Proof that the Akron-Williams is the best is the fact that the big tire manufacturers use it—Firestone, Goodyear, Diamond, Republic, Pennsylvania, Revere, Hartford, Consolidated, Empire, Manhattan, Shawmut and many other tire manufacturers are among our customers. They know by experience what is most practical. We can equip a tire repairing plant of any desired capacity. Don't delay getting into this profitable business. Get into correspondence with us to-day.

Casing Repair Vulcanizers
Air Compressors and Tanks
Steam Boilers
Inside Patch Vulcanizers
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Retreading Molds, etc., etc.

ROTARY RASPS

TO MOUNT ON THE BUFFING STAND.

Remove old tread and rough up carcass in a
fraction of the time required by other methods.

PRICE COMPLETE, \$12.00.



THE WILLIAMS FOUNDRY & MACHINE CO., Glendale Avenue, Akron, Ohio

Please mention the Automobile Dealer and Repairer when writing to advertisers.

The Incomparable 400 Blower, the one great Heirloom that will be handed down from one generation to the other. Ask What the Owners Say.

The 400 Steel Blower will serve the youngest mechanic faithfully without expense for a long lifetime.



Crank turns either way.

The Famous 400 Champion Steel Blower.

Over one half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.

The No. 400 Champion "Whirlwind" Blast Anti-Clinker, Heavy Nest Tuyere Iron is furnished with all 400 Blowers WITH-OUT EXTRA COST.



No. 408 Steel Blacksmith's Forge.



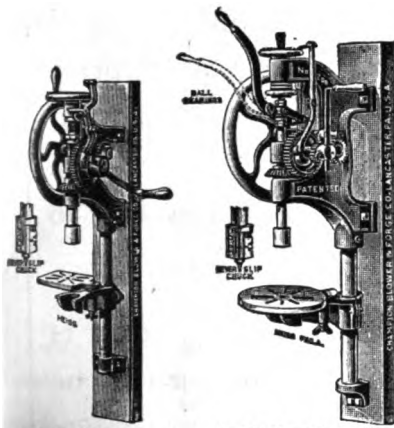
No. 401 Steel Rivet Forge.

Champion "Patented" Automatic Self-Feed and Lever-Feed Upright Post Drills

Made With Ball Bearings only

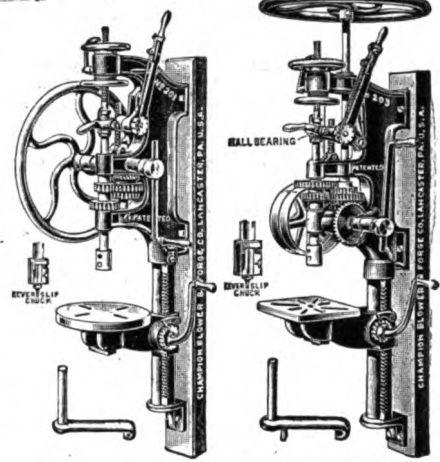
With the LEVER- or AUTOMATIC SELF-FEED 95 per cent in Time and Labor is Saved by the INSTANTANEOUS RAISING OF the Drill Bit out of the hole just bored and again replacing the drill bit back on the material ready to bore the next hole. Remember—There is no TURNING BACK of the FEED Screw NUT WITH EITHER FEED.

Before purchasing a Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power Blower, or Electric Blower, write for our free catalogue, which always shows the greatest variety of improved Blacksmith tools built under one control in the world.



No. 90 Drill.

No. 200 Lever-Feed Drill.



No. 201 Self-Feed and Double Compound Lever-Feed Drill.

No. 203 Self-Feed and Double Compound Lever-Feed Drill.

THE CHAMPION BLOWER & FORGE CO., Lancaster, Pa., U. S. A.

Some of Our Specialties

WE MANUFACTURE

Wind Shields,

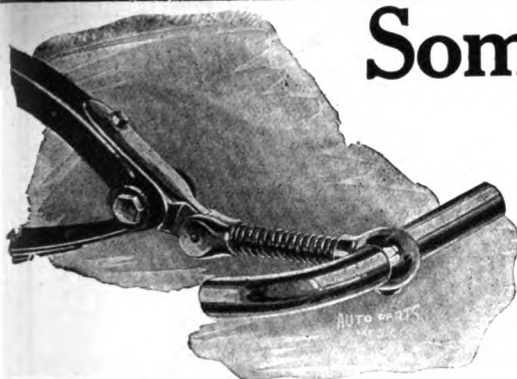
Gasolene
Vulcanizers,

Safety Grips,

Foot Rails,

Foot Pedals,

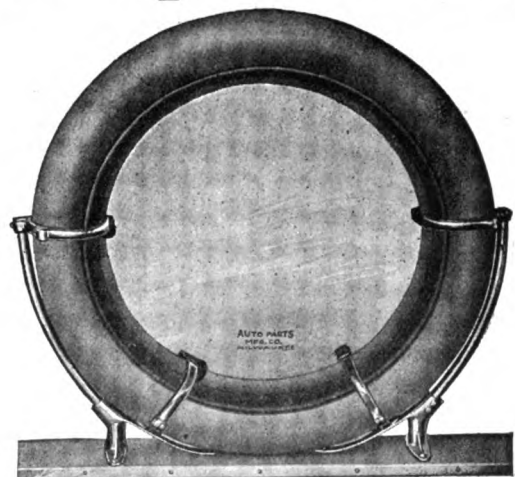
Symphony Horns.



BADGER SPRING BUMPER

The reason there are not more Bumpers used is that owners object to the changing of the spring hanger bolt and drilling numerous holes in the frame. To attach our Bumper, drill one 5/16 in. hole in the end of side bar and fasten as shown in cut, which can be done in ten minutes, and will fit any car.

In case of an accident, a thrust is against the point of greatest resistance. The springs are oil tempered and of our own design, brackets of cast steel, bar of selected one and one-quarter inch steel tubing, brass covered.



BADGER TIRE HOLDER

The Tire Holders can be bolted to the running board of the car, obviating the necessity of boring into the body.

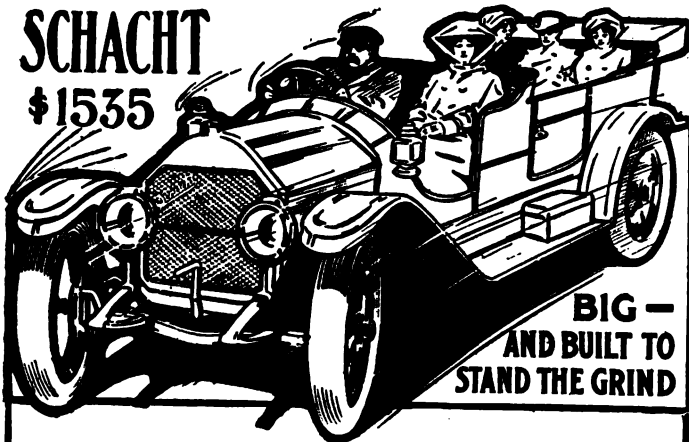
They will hold one or two, three and one-half to five inch tires, and can be equipped with chain and padlock instead of straps if desired.

WRITE FOR CATALOG TO-DAY.

AUTO PARTS MFG. CO., 163 Michigan St., Milwaukee, Wis.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

SCHACHT
\$1535



THE INVINCIBLE SCHACHT The Car That Clinches Sales For You

Here, Mr. Dealer, is a really big car—at a really low price—a 40 horsepower engine—120 inch wheel base—a big, roomy body in which 7 can ride easily—all for \$1535.

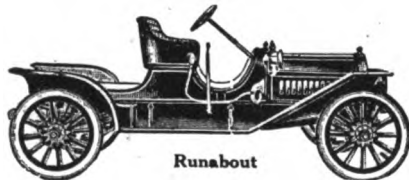
There is not another car on the market that can duplicate the Schacht even on these three important points, for anywhere near the money—and specification for specification the Schacht will save from \$400 up over any car made.

These are real talking points—real selling points—but they are only half the story.

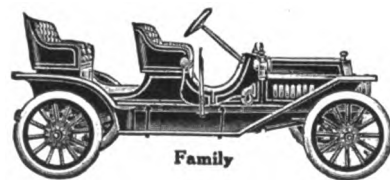
In addition to its bigness—its power—its speed—the Schacht is built in a way no other medium priced car has ever been built. A great big engine—the biggest crank shaft ever put into a four cylinder car—4½ in. and 4½ in. bearings—gears and transmission as big as you find in the average "sixty"—every part built to stand the hardest kind of hammering and come back for more.

One good look at the Schacht—its bigness—power—the way she's built—makes the red blooded man or woman keen to drive it. The margin of safety in every part makes it the one car for the conservative.

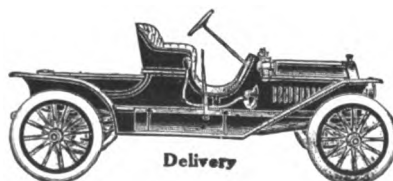
At \$1535 the Schacht is a cinch to sell.



Runabout



Family



Delivery

3 in 1 Car

There are a lot of people who want a smaller car. To such a class the Schacht 3 in 1 offers many big advantages. It is not only striking looking and able to stand the racket of hard usage under all conditions, but its quick and easy convertibility from a runabout to a touring car or a delivery wagon make it the most useful and easiest selling car of its class on the market.

The Schacht is the line you've been looking for—let us prove that to you.

THE SCHACHT MOTOR CAR COMPANY
2757 SPRING GROVE AVE. CINCINNATI, OHIO

Just What I Want



MOHAWK TIRES

BELIEVING the time is opportune for the manufacture and sale of a first class Tire at a price that makes the tire cost of an automobile within reason, we are manufacturing the "Mohawk" to meet this demand.

Our selling list printed here is like our tires, something to be proud of.

Really, what does the mileage guarantee amount to?

Of course, all "Mohawk Tires" are of good quality and are so guaranteed to give mileage within reason, but why not "Be your own Insurance Company."

Consumer's List

	Casings	Tubes
28x3	\$11.50	\$3.00
30x3	12.40	3.80
32x3	14.00	3.55
30x3½	17.25	4.45
32x3½	18.50	4.70
34x3½	20.00	5.00
36x3½	22.00	5.25
30x4	24.00	5.75
32x4	26.50	6.00
34x4	27.45	6.25
36x4	28.30	6.50
38x4	30.20	6.80
34x4½	35.00	7.75
36x4½	38.00	8.25
36x5	42.00	9.00

Living Propositions to Live Dealers

Special Introductory
Prices to Consumers.

**MOHAWK
TIRE CO.**

Dept. A

210 Genesee St.

Utica, N. Y.

"BECCO" SPECIALTIES

SAVE TROUBLE

Standard Terminal.

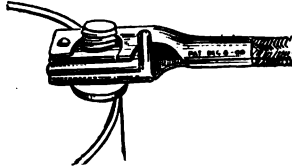


Instantly locates ignition troubles. Has a "sparking gap" (see cut) which makes it an ignition terminal and spark-tester combined. Can be used with about any spark plug, easily attached and detached. A little thing and inexpensive, but likely to earn its cost a thousand times over. Price, 15c Each.

Battery Connector.

It simply cannot break or work loose or go wrong. Every driver has known the annoyance connected with battery-connectors. This connector is a positive assurance against any annoyance.

Price, 10c Each.

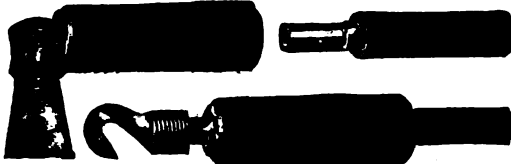


Wrench Set.



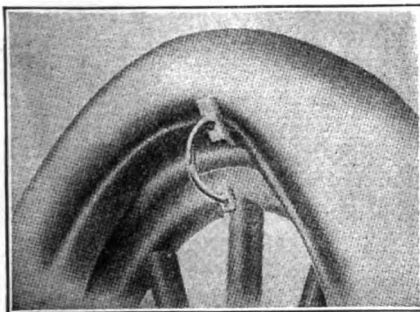
An unique combination tool for small bolts and nuts. Fits eight different sizes of nuts and also provides a screwdriver. Indispensable for the modern auto tool box. Price, \$1.00 Each.

Special Terminal.



Has not only the "Sparking Gap" feature, but a "Cut-out," so that any cylinder can be electrically disconnected, without removing the terminal from spark-plug. All parts are insulated by means of a fibre sleeve. Impossible to receive an electrical shock, while manipulating. This is the last word in Sparking Terminals. Price, 35c Each.

Tire Grip.



For use with Clincher Tires. It takes the place of a man. When you are putting on a tire, the lip of course has to be held in the rim of the wheel at one point, or the tire will keep creeping out as you work around to get it in. Ordinarily another man has to help with a tire iron to get the tire in place. Price, 50c Each.

If you cannot get "Becco" Specialties from your dealer, we will supply, postpaid, at the above prices.

Good Dealers Wanted As Agents.

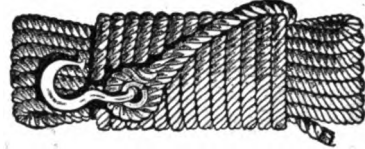
THE BECK COMPANY, Box 67F, Rockville Centre, N. Y.

The Abbott-Detroit "Bull Dog" Carries

MOTOROPE

TRADE

MARK



Read this Letter:



New York February 21, 1911.

Asch and Co.,
1779 Broadway, New York City.

Gentlemen: Previous to leaving on my 100,000 mile Durability

Run with the Abbott Detroit "BULL DOG" I purchased two of your MOTOROPES and now after four months' use they are still in good shape and I have travelled 28,700 miles. I have used them day after day wrapped around the rear wheels to enable me to travel through the deep snow between New York and Chicago and in the Minnesota snow, and in the South they did yeoman service in pulling the car across streams and pulling it out of the mud and clay. I send you a picture of the car stuck in the deep snow outside of Warren, Pa., where the snow came clear up to the trunk rack, and yet the MOTOROPE got me out. It has been indispensable and I wish you would ship me by express to the John Deere Plow Co. Dallas, Texas, two more of the half inch size, as I leave shortly for Mexico.

Respectfully yours,
C. Gilbert Russell, N.D.
Associate Editor.

MOTOROPE is made of specially selected Manila fibres, and is far superior to ordinary hardware-store rope.

No. 1. 30 feet, 1/2-inch diameter, \$1.

Tested strength, 2,900 lbs.

No. 2. 40 feet, 3/4-inch diameter, \$2.

Tested strength, 5,000 lbs.

Each with galvanized hook for quick attaching.

Block and Tackle Outfits, \$4 to \$15.

Notice the name, "MOTOROPE."

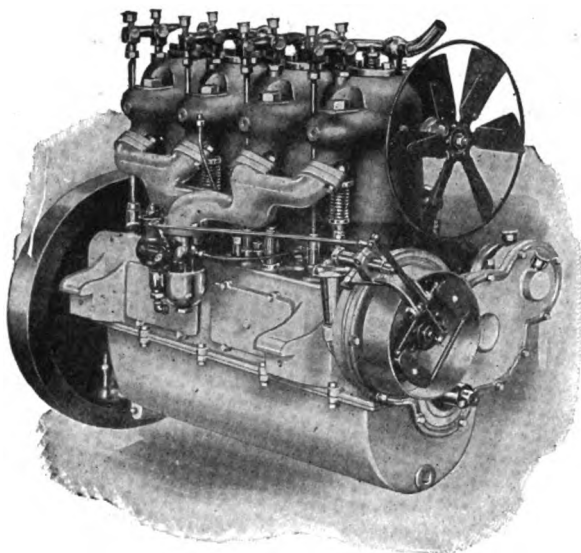
Beware of Imitations.

ASCH & CO.

1779 Broadway,

New York

Please mention the Automobile Dealer and Repairer when writing to advertisers.



No. 11.—Single cylinder, stationary engines, 2 to 125 H. P.

Our 35 H. P. motor holds the world's speed record for one hour, for motors under 300 cubic inches displacement, made last November in Los Angeles in a Cutting Car.

Model Gas Engine Works

Lock Box, 2002.

PERU, IND.

WE have the most complete line in America. Write for the following catalogs of the line in which you are interested.

No. 18.—General construction of all motors from $3\frac{1}{2} \times 4\frac{1}{2}$ to 5×6 , cone clutches and transmissions.

No. 20.—30 to 40 H. P. unit power plants with 4 forward speed transmissions and governor.

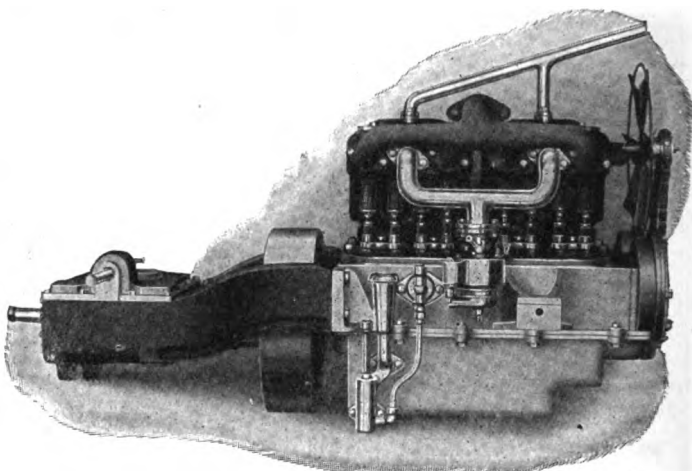
No. 21.—22 H. P. unit power plants with 3 forward speed transmissions.

No. 19.—Wells clutch.

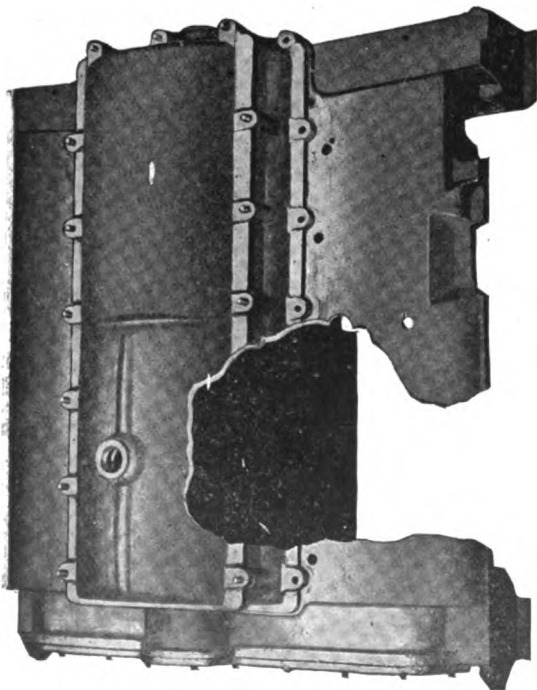
No. 17.—4 cylinder, marine engines, 12 to 500 H. P.

No. 16.—4 cylinder, stationary engines, 12 to 500 H. P.

No. 15.—4 cylinder, stationary engines (suction gas type), 25 to 500 H. P.



We Do Welding—Right



Broken Crank-case Before Repairing.

We weld cast-iron, aluminum, brass, copper, steel and sheet-metal successfully and guarantee our weld *Every Time*.

We make a specialty in welding cracked cylinders and water jackets, crank cases, gear cases, of cast-iron, malleable iron and aluminum.

Any broken part of automobiles, pumps or engines and other parts of machinery, whenever made of metal, we weld to last as long and to be as strong as a new part, thereby saving the public from 50-75% whatever a new part would cost.

Our facilities are such that we can take care of any quantity of work which may reach us, to have it returned to our customers at least inside of two or three days.

Quite often the customer can wait for and see how it is done.

We make no secret of our process and let the customer see it if he wants to.

Estimates given after we see the broken parts, in fact, we like to tell the customers what it will cost before doing it, thereby giving more satisfaction for both sides.

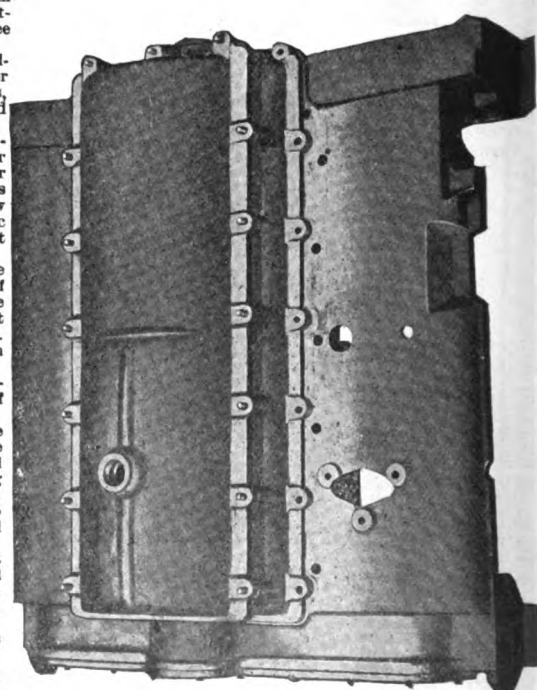
Nothing too small nor too large of what we could or would not be able to take care of.

Our works are so located that they can be reached by water, rail and roads. Automobiles can drive in our yards and leave cars, till repairs are done.

Quite often, we do the repairs without dismantling the cars.

TRY US AND BE CONVINCED

Write for estimates and interesting printed matter.



The Same Crank-case After Being Repaired.

The Superior Welding & Machine Co.,
Connected by Telephone.

MUNRO & CO., Props.

Quintard Place, near Atlantic Square,
STAMFORD, CONNECTICUT.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



"Our Shaler Has Not
Only Paid for Itself
But Has Paid The
Wages of an Extra
Man and the Rent
of our Building
as Well."

WHAT the Shaler has done for
this man, it will do for you.
We sold him a style B and the above

is a quotation from the letter he wrote us a short time later. He is a
practical business man or he wouldn't be running a garage. His exper-
ience may be worth something to you.

SHALER Vulcanizers

Electric or Alcohol Heated

Can just as well be paying your garage rent

In the first place, they will do any kind of tire repair work. Second, they **cost less than two cents an hour to operate** and are so simple and reliable that any boy who can wash a car can make more money for you with one than could a first-class mechanic with a full equipment of tools.

When you stop to think that the material and current for a fifty cent repair cost you only two or three cents, it's mighty plain that the Shaler is a paying proposition. **Why, a couple of dozen repairs will pay for the vulcanizer**, and after that every repair means from fifty cents to three or four dollars added to your bank account.

The season is just opening, bigger than ever. More tires are going to be punctured and torn than ever before. Somebody will have to repair them.

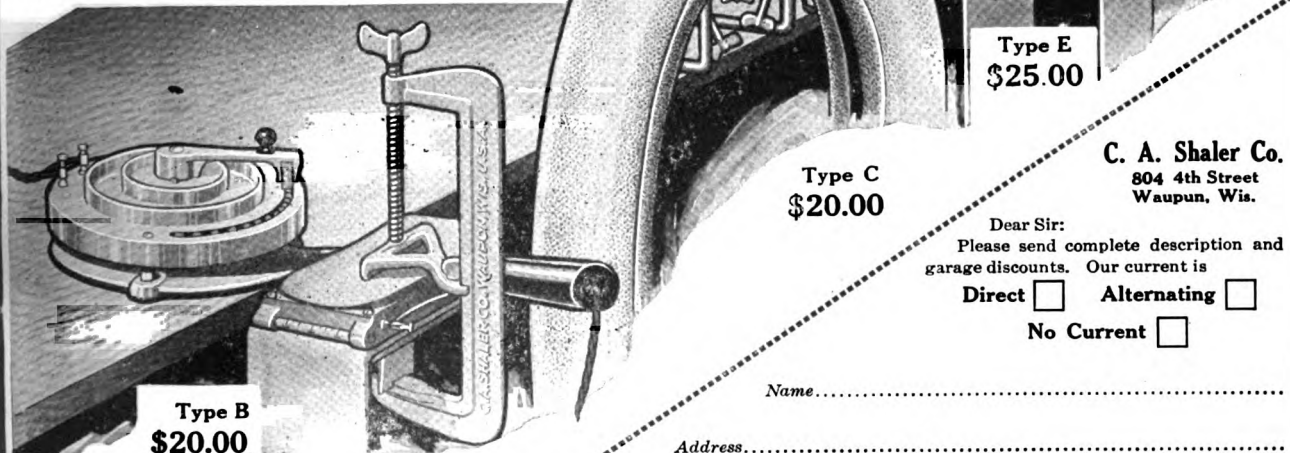
Do you want the profits on this work?

**Send for Free Hand Book
And Confidential Dealer's Discount**

Tells all about the Shaler and its money making possibilities—
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OUR WORK IS BEST AND
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WE WELD ALL KINDS OF BROKEN MACHINERY

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MACHINE WELDING AND CONTRACTING CO.

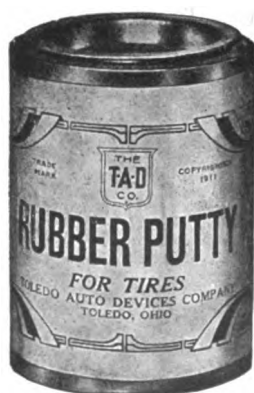
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RUBBER PUTTY

*The Greatest Invention of its Class.
A True Money Saver and a Protec-
tion to Life and Limb.*



RUBBER PUTTY

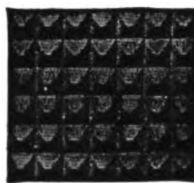
Prevents blowouts, avoids
sand blisters, saves fabric from
decay, keeps out water, causes
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smoothly.

Requires no cement, will vul-
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minutes, does not soil the hands.
Saves over \$50 in the season,
gives safety in speeding.

A can of RUBBER PUTTY
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ALUMINUM MATTING

For Automobile Running Boards, Floor Boards, Motor
Boat Floors, and for any place where matting is ex-
posed to severe wear.

Aluminum Matting is very easily applied.

It will not rust, tarnish nor stain from the effects
of oil, grease or gasoline.

It can always be restored to its original brightness
when washing the car.

Yet it costs less than good rubber and will last
much longer.

Stock sizes are 9, 10, 12, 14, 15, 18 and 20-inch
widths, in rolls of about 50 lineal feet, and 24 and
30-inch widths in 24-foot rolls.

Also in sheets 36 inches wide by 84 inches long.

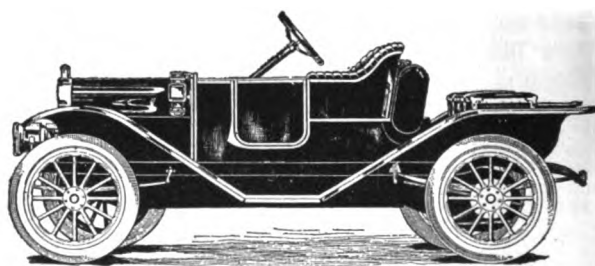
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the quantity is sufficient to warrant.

Samples of matting and further information
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This Handsome 30 H. P. Roadster \$1,150.

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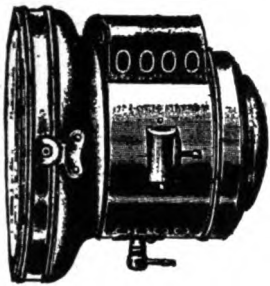
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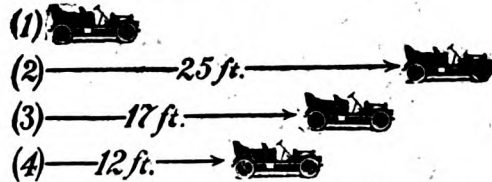
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The End of Your Spark Troubles

Just Put Them In And Forget Them

If you are looking for a Spark Plug that is always on the job—that will not short or soot over—break porcelains or cause trouble of any sort—get a Set of No. 8

Never-Miss Spark Plugs

Built by men whose "know how"—ends your spark troubles. Have stood the test of seven years. Over a million and a quarter satisfied users. Magneto Type, Regular and Extension Type, open end.

One Dollar For Any Type or Size.

Guaranteed One Year

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Lansing, Mich.

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"SAMSON" Electric Horn



No. 1 Outfit
Wt. Packed
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Cast Brass Base
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Projector, 16 in. long,
12 ft. Cord and Push.

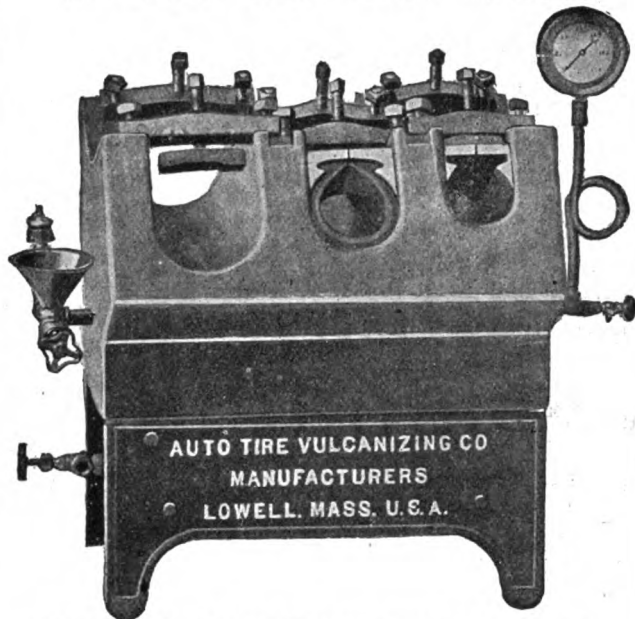
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Give a **hotter spark** than any other plug made and therefore explode a **thinner mixture** of gas. Therefore **more power** and **less carbon**.

Bear these points in mind and insist upon no other in your motor equipment.

Sold by good dealers everywhere.

Price, \$1.50.

Booklet and descriptive matter for the asking.

The Plug with a Guarantee.

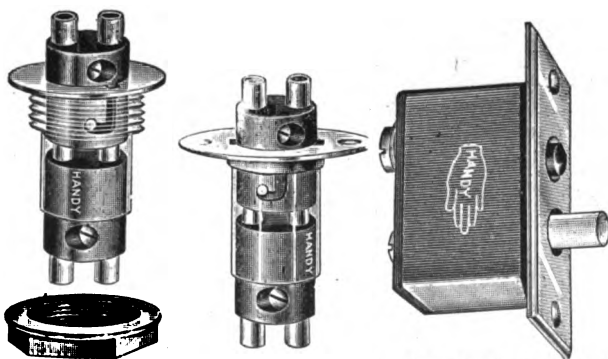
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No. 4500—Dash Receptacle and Plug

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"HANDY" Flush Push Switch

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ALL MANUFACTURERS, DEALERS and REPAIRERS of AUTOMOBILES should have one or more of our REVOLVING CASES. They occupy but a small space and their capacity is very large. Each drawer is locked in the Case, which prevents the mixing of the contents of the drawers. They are made in various styles and sizes.

Catalog and price list sent on application.

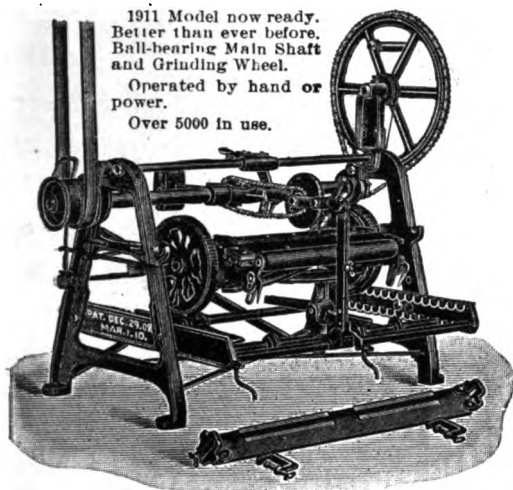
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1911 Model now ready.
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Ball-bearing Main Shaft
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Operated by hand or
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Over 5000 in use.

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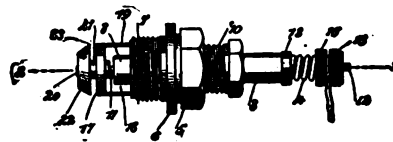


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PATENTED.

GUARANTEED FOR ONE YEAR.

"No Wires to Burn Away or Melt."



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Applied for March 24, 1908.

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WHAT HE FIRST SAID.

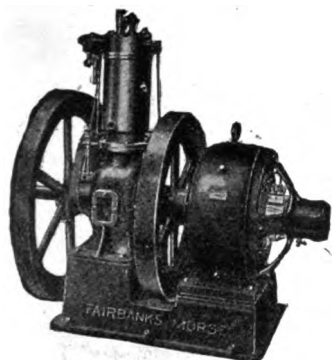
BEST Ignition Co., New York. Aug. 9th, 1910.
Gentlemen:—I beg to say that your Plug is without exception the Best that I have ever used, and I don't think there are many I haven't tried. Your plug is well named.
Very truly yours, (Signed) A. B. Beggs.

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Gentlemen:—Since writing you on Aug. 9th, 1910, I have run my Winton Six on your "Best" Plugs 5,000 miles without changing. This has pleased me so that I feel called upon to write you a word of praise. The plugs I am using now are as good as the day I bought them and I am anticipating three times the mileage from them. I am still of the opinion that you have the Best plug made and I am making it a point to see that all of my friends are getting next to the best thing made in the way of a spark plug. Wishing you continued success, I am,
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Illustrating the kind of service the "Best" Plugs give.
"Best" Plugs work equally well on all makes of cars.

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Generating Set for Automobile Charging Stations

This compact unit is especially adapted for use in garages on account of its reliability, close regulation and automatic operation.

Sizes, 2 to 12 H. P.

Write for Catalog
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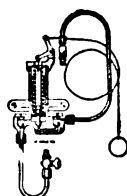
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The only practical tool for seating valves accurately and quickly. The method of operation is simple. Any amount of testimonials furnished.

THE "CRONE" PRIMER

Do not exhaust yourself cranking your automobile—the Crone Primer will give the engine a quick start.



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WE are fully equipped to rebuild or repair any type of Radiator. Send your work to us via express. We will examine and report the cost, awaiting your order to proceed. Special attention paid to Radiators bearing this name plate.

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THE STRYKER MUFFLER CUTOUT

The "STRYKER" is the only cutout that will relieve 100 per cent of the back pressure on any engine.

The "STRYKER" increases your power, helps you over the hills and bad places, keeps your engine from heating, and prevents carbon accumulation.

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Reliance Spark Plugs

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2nd.—Reliance Spark Plugs produce a more intense, concentrated spark than any other plugs; and a hot concentrated spark—not a “big, fat” scattering spark—gives the quickest and most effective explosion. Think that over

3rd.—Reliance Plugs take less battery power than any other plug.

4th.—Reliance Plugs are absolutely soot-proof—you don't have to clean them.

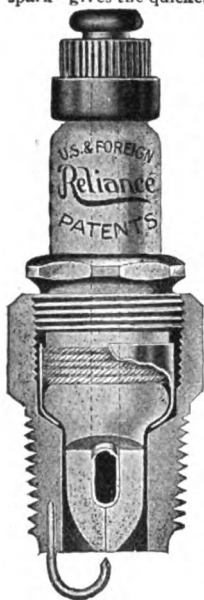
5th.—Reliance Plugs are absolutely proof against any form of carbon.

6th.—Reliance Plugs are absolutely proof against any combination that you or anyone else can find in a gas engine cylinder. They work as long as there is any power in your batteries.

7th.—Reliance Magneto Plugs are supreme where excess oil is used. It will never put them out of business.

8th.—Equally satisfactory for air cooled or water cooled motors.

9th.—Porcelain won't crack from heat—an exclusive heat proof composition—fully guaranteed.



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Once use Reliance Spark Plugs and you will never go back to any other. Try Reliance Plugs and prove it.

We guarantee satisfaction, your money back, or a new Plug.

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Always have been. We intend they always shall be.
Infringe NO Patents.

Have not reduced the number of cross chains to lessen our cost. When we can't give an honest chain, we'll quit. Our Adjuster fits any size chains.

Let us tell you more about our goods and quote you.

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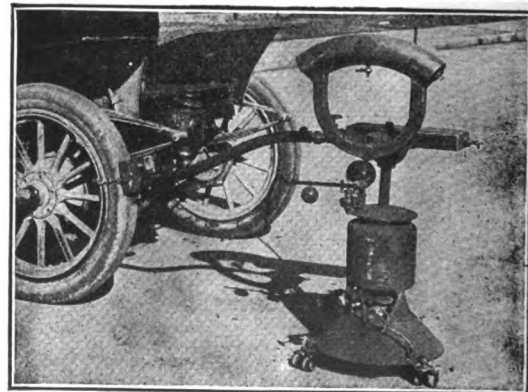
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A STEAM VULCANIZING PLANT

Complete for Casing and Tube Repairs yet so simple that it can be operated by your shop boy.

USED EVERYWHERE—ANY TIME



The M. A. C. VULCANIZER has an extension steam arm that permits you to take the heat to the tire while on the wheel. This is but one feature.

WRITE FOR OUR DESCRIPTIVE CATALOG.

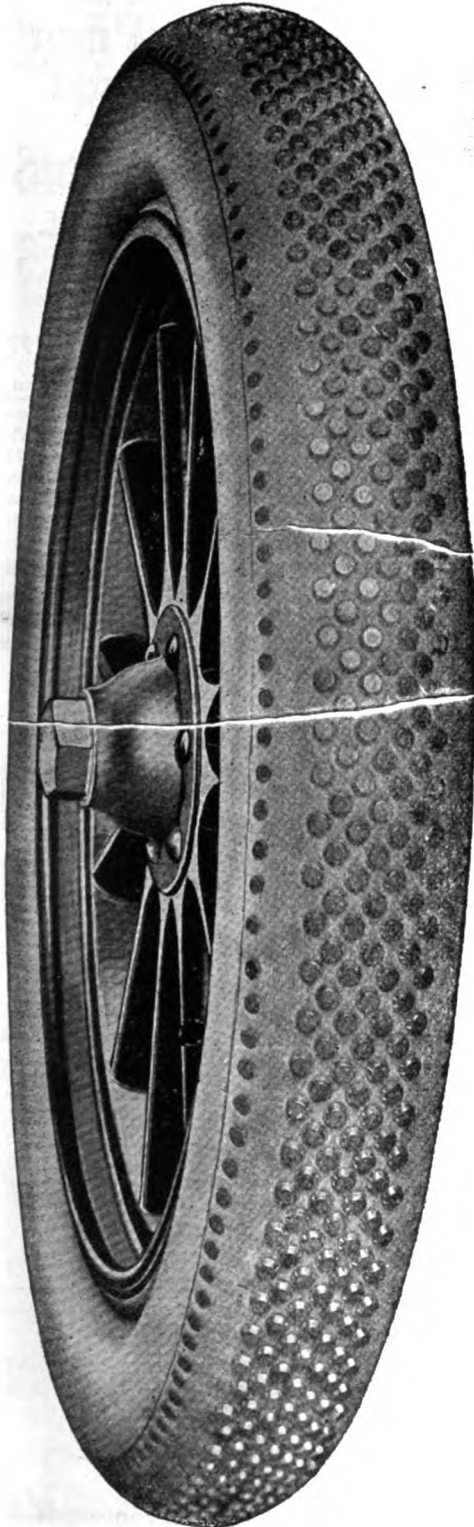
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There is no elasticity in the tire itself.

The tire transmits the shock to the air cushion, which absorbs it.

The tire prevents the escape of the air cushion through leaks caused by punctures, blow-outs and wearing-out.

The tire provides the traction to convert energy into motion.

Therefore—

A satisfactory tire should combine materials giving resiliency, strength, imperviousness and a non-slipping surface.

The KING Combination Tire

is the only tire which possesses **all** these requisites. There is no other tire like the King as its special features are fully protected by patents against infringement.

It is **not** a tire protector, tire cover or tread but a **complete tire** and carries a **Steel Shod Guarantee** of double mileage and against punctures and blow-outs.

Don't compare our prices with others without comparing our goods—that is all we ask—we invite such comparison.

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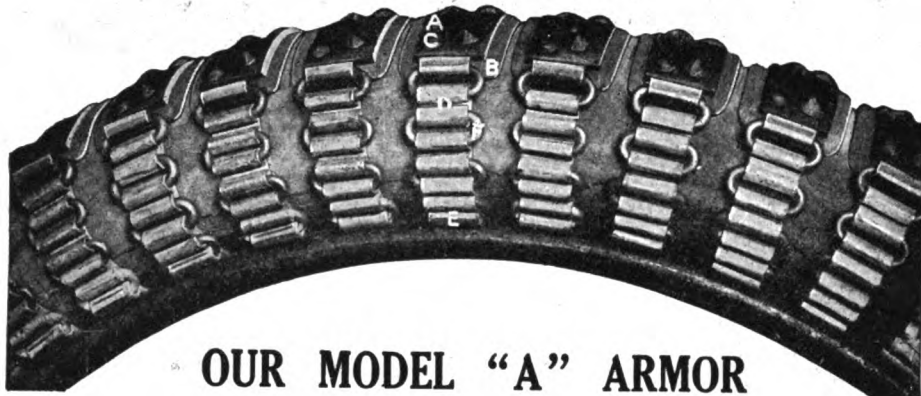
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DAVIS PNEUMATIC STEEL TIRE ARMOR

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to FALL OFF
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IT IS AS NOISELESS AS ANY STEEL STUDDED TIRE. IN NO WAY AFFECTS THE INNERTUBE.
PRICE—ABOUT 60% OF CASING. WRITE FOR PRICES AND LITERATURE.

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We can weld successfully **Cast Iron, Steel, Aluminum, Brass** and all other materials by the Oxy-Acetylene Process.

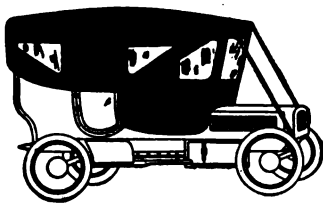
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Keeps Your Tires Hard—Makes Them Wear Longer

INFLATE YOUR TIRES PROPERLY—pump them up to the same pressure—don't have a "softer tire" and let that tire be subjected to unnecessary wear and tear. By means of the

Trojan Tire Pump "The One Right Way To Pump Up Tires"

you can inflate all your tires to exactly the same pressure—the automatic indicator makes this result absolutely certain and, what is more, you can see it yourself. By pumping your tires with the Trojan you can actually make the cost of the pump by the amount you save in tires—and in a very short while. The Trojan is

Unlike Any Other Tire Pump

and, because of its extreme simplicity and few parts, is sold for less than any pump on the market. Is powerful—will pump up a 36x4½ inch tire in 3 minutes. Is portable—can be moved anywhere—while all the power needed to operate it can be obtained from an ordinary electric light socket. Is perfectly simple—easy to understand and absolutely guaranteed to be dependable—takes up little room and when not in use can be put in an out-of-the-way place. Made in two sizes; the one-cylinder for private use, \$75 for direct current and \$85 for alternating current; the two-cylinder for garages, \$140 direct and \$150 alternating current.

Write for Leaflet—"The One Right Way to Pump Your Tires." It gives full information and prices.

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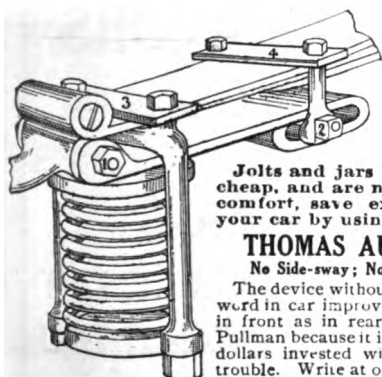
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IS PORTABLE

—You can take a TROJAN to the CAR—you don't have to take the CAR to the PUMP.



Attach to an ordinary electric light socket—set the automatic indicator—turn on the current—that's all there is to it. No trouble—no work—and exact pressure on all your tires.



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Jolts and jars make the best car seem cheap, and are no longer necessary. Have comfort, save expense, give new life to your car by using

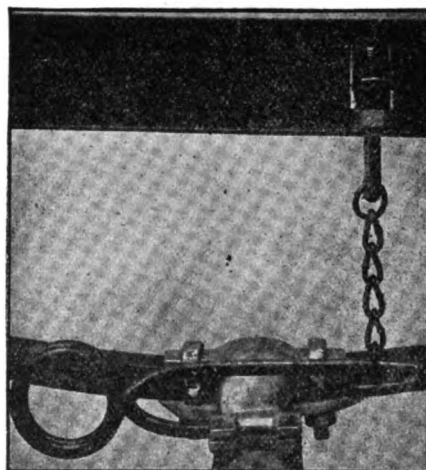
THOMAS AUXILIARY SPRINGS

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The device without a rival, because it is the last word in car improvement and works just as well in front as in rear. Makes your car ride like a Pullman because it is the acme of flexibility. A few dollars invested will save you many dollars in trouble. Write at once for trial offer to

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Shock Absorber

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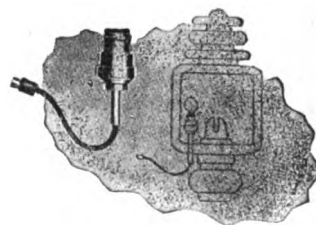
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GUIDE MOTOR LAMP MFG. CO., Cleveland, Ohio, U. S. A.



Escape by using YANKEE TIRES AND TUBES

The quality will satisfy you. Prices will surprise you.

No better tires or inner tubes at any price.

We can save you big money.

Write Now for 1911 Price List.

THE YANKEE CO., 69 Genesee St., Utica, N. Y.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



HESS-BRIGHT Ball Bearings are easy to get

They can be used, not only to replace HESS-BRIGHTS, but to replace other and cheaper makes which have failed in service. Their sizes are standard.

Write or wire the nearest distributing house, giving the trade-mark letters and number of the bearing you wish to replace. The correct HESS-BRIGHT bearing will be promptly sent.

LOCAL DISTRIBUTORS FOR RETAIL TRADE ONLY

1974 Broadway, THE HESS-BRIGHT 1800 Michigan Ave.,
New York, N. Y., COMPANY Chicago, Ill.

The more frequently used bearing sizes
are also carried in stock by

Boston, Mass., THE POST & LESTER CO., Hartford Conn.

CHANSOR & LYON MOTOR SUPPLY CO.,
San Francisco, Los Angeles and Fresno, California; Seattle
and Spokane, Washington.

The HESS-BRIGHT
MANUFACTURING CO. 2119 Fairmount Avenue
PHILADELPHIA, PA.

BEWARE.

Don't buy tires that blow off the rims and are otherwise inferior imitations, trading upon the good name of "IMPERIAL."
If you value the lives of yourself, family and friends, see that the name "Imperial Tire Co. of New York" is on your tires.

We are the originators of "IMPERIAL" tires and the improved process employed by the several mills who have made them for us.

We are desirous of maintaining the standard of our tires and shall fight infringements or deceptions.

We represent a majority of the "Standard" manufacturers in the disposition of their job lots, to whom we refer you.

CLINCHERS, DUNLOPS, Q. D. CLINCHERS.

Size	Our Unguaranteed	Our Guaranteed	Standard List
28 x 3	\$10 87	\$13 85	\$14.50
30 x 3	12 23	15 15	15.50
30 x 3 1/2	16 81	21 75	22.85
32 x 3 1/2	18 88	23 10	24 40
34 x 3 1/2	19 70	26 27	26.55
36 x 4	30 88	27 18	32.80
32 x 4	21 74	28 98	35.30
34 x 4	28 77	31 69	37.75
36 x 4	24 71	32 94	40.25
34 x 4 1/2	39 00	38 66	47 85
36 x 4 1/2	30 67	40 90	50 75
36 x 5	34 67	46 23	62.80
37 x 5	35 36	47 14	64.00

WRITE FOR PRICES OF OTHER SIZES.

Tubes.

"Independent" 30% off. Job lots of Standard makes at 40% to 60% off Q. D. flaps \$1.00 extra. Goods shipped with privilege of examination. Money refunded on goods returned intact within a week.

AUTOMOBILE TIRE CO., Inc.

ED. C. GRIFFITH, Pres.

Tel. Col. 2386.

Cable, Autotires.

1625 Broadway, New York City

The Oldest Auto Tire Jobbing Concern in the U. S.,
and Largest in the World.

HORSEY

THAT'S THE NAME

ONE
MINUTE
REPAIR



USE
GASOLINE
ONLY

No Cement

No Acid

Inner Tube Patch

One trial of Horsey No Cement Patches and you will consign Cement and Acid Repair methods to the scrap-heap and be dollars ahead by doing it.

Automobile Kit, box contains 10 assorted patches, \$1.00.

Motorcycle (Vest Pocket) Kit, box containing 6 small patches, 50 cents.

Manufactured exclusively by

The Horsey Manufacturing Co.

5606 Euclid Ave., Cleveland, O.

FOR RADIATORS

STOPS A LEAK IN
FIFTEEN MINUTES

FINDS IT
AND FIXES IT
WHILE YOU
WAIT

Lubri-
cates
and pre-
serves the
metal. Saves
shop bills.
Lengthens radi-
ator's life.

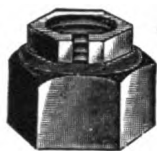
75 CENTS

at your dealer's
or from us.

THE NORTHWESTERN CHEMICAL CO.,

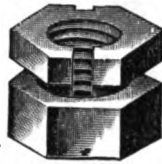
Makers of the "Chemically Correct" line of Auto Specialties,
MARIETTA, OHIO.

A NECESSITY ON AUTOMOBILES!!!



ORIGINAL.

What?



IMPROVED.

COLUMBIA LOCK NUTS.

They Will Not Shake Loose.

A LOCK NUT, NOT A NUT LOCK.

Our "Green and Yellow" booklet tells "WHY" ordinary nuts shake from bolts and "WHY" the "COLUMBIA" don't.

No Tool Box should be without a package of assorted sizes—100 pieces, 5/16 inch to 3/4 inch, \$3.00. Put up by our agent,

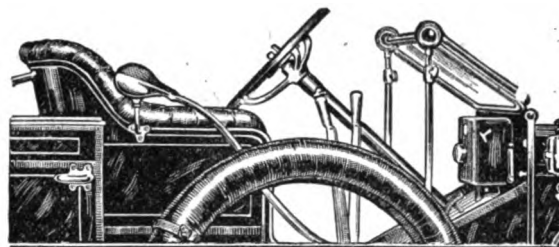
DANIEL L. TOWER,

107 Chambers St., New York City.

COLUMBIA NUT AND BOLT CO., Inc.,

BRIDGEPORT, CONN.

Discounts to the Trade and Car Builders.



Know an Auto from Hood to Tires

Expert knowledge of automobile construction is essential to car owners, repairmen, and drivers alike. To the owner it means certainty when judging a car, and a great saving in cost of up-keep. To the repairman, or driver, it means a greater demand for his services, a larger salary, and a permanency of position. To all it means knowing if a car is right, and when not right, exactly what to do and how to do it.

All this valuable knowledge is set forth in the Automobile Course of the International Correspondence Schools. The subjects covered are: Gasoline Automobiles, Gasoline Automobile Engines, Automobile Engine Auxiliaries, Automobile Carburetors, Electric Ignition, Transmission and Control Mechanism, Bearings and Lubrication, Automobile Tires, Automobile Operation, Troubles and Remedies, Overhauling and Repairs.

This Course has been prepared by recognized experts actually in the business. In other words it is practical as well as theoretical.

To learn all about it, and how you can most easily become an automobile expert, write today to

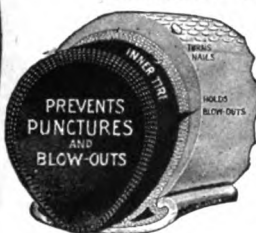
International Correspondence Schools

Box 1413, Scranton, Pa.

THE MURRAY PATENT "INNERLOCK"

INNER TIRE

Is a Complete "Tire Within a Tire."



Provides greatest mileage at lowest cost and reduces tire trouble to a minimum. Makes all tires, including old, weak and overloaded last until worn clear through—and then can be removed and used again.

The Best Tire Re-Inforcement

Being made four to six ply (as heavy as the tire) of patent construction cross laid fabric with self-sealed flap so that it fully re-inforces the sides (always the weakest point) making a BLOW-OUT, RIM-CUT or PUNCTURE ALMOST IMPOSSIBLE.

Also Largely Used in Taxicab Rental and Commercial Cars

Equip YOUR tires now and SAVE HALF your expense—the earlier placed, the greater extra mileage gained.

Agents and Dealers

wanted to handle this fast selling proposition. A full line of Blow-Out Patches and Reliners. There's money in this for you if you act quickly. Write for territory and proposition to-day. It's a winner.

DOUBLE FABRIC TIRE CO.

18 East 7th Street

Auburn, Ind.

New York Agency, Baker Sales Co., 1775 Broadway

THE GENUINE MAHER DUPLEX MULTI

Only Genuine Self Cleaning Spark Plug on the Market

IN THIS SPARK PLUG is embodied a double annular spark gap, one working auxiliary to the other. The sparks ordinarily cross the upper spark gap; thus, should the sparks fail to cross the upper gap for any reason, the lower flange provides an auxiliary spark gap, insuring the proper sparking and ignition of the gas to obtain the best results. The lower flange or electrode closes the end of the firing chamber in such a manner that it also acts as a baffle to keep the oil from entering.

The enclosed firing chamber in which gas, accumulated under pressure during the compression stroke and being fired up in the cavity, is shot forcibly out into the cylinder upon ignition, carrying with it all soot and foreign matter, causing the spark gaps to be automatically cleaned and also causing a complete combustion of each charge. Porcelain cannot break thru heat or expansion as it is shielded from direct contact of the hot and cool gases of the explosion and compression strokes. Price \$1.25.

N. B.—"This ad. is worth \$0.50 per plug up to six plugs, when sent in accompanied by 75 cents for each plug ordered." (List price, \$1.25.)

Pat. July 29, 1910.



PAT. JULY 29, 1910



Write for Dealers' Discounts

THE DUPLEX MULTI-SPARK PLUG CO., Devil's Lake, North Dakota

Please mention the Automobile Dealer and Repairer when writing to advertisers.



"Ideal" Inner Sleeve

To remedy a "blow-out," or if applied to a weak spot will keep an old shoe in service.

PRICE LIST

3 in., \$1.00	3 1/2 in., \$1.25
4 " 1.50	4 1/2 " 1.75
5 " 2.00	



"Ideal Twin" Sleeve

Designed to permanently as well as temporarily provide against "Blow-outs" or rim cuts. An inner sleeve and an outer jacket with wearing surface combined.

PRICE LIST

3 in., \$3.00	3 1/2 in., \$3.75
4 " 4.50	4 1/2 " 5.00
5 " 5.50	

Standardized and Reliable

For sale by principal dealers. If your dealer does not handle them, write direct to us.

Full Line Auto Tire Repairers' Stocks, Frictions, Tread Stock, Patching Gum, Cement Sheet, etc.

WRITE FOR SAMPLES AND PARTICULARS

VOORHEES RUBBER MFG. CO.,

18 to 46 BOSTWICK AVE., JERSEY CITY, N. J.

38 VESEY ST.,
NEW YORK.

34 COLUMBUS AVE.,
BOSTON.

87 WASHINGTON ST.,
CHICAGO.

REX

In offering "REX" METAL CREAM to dealers we present a metal polish of unusual quality—one that not only cleans and polishes brass, nickel, steel, etc., but also brings out or renews the original lustre of the metal itself.

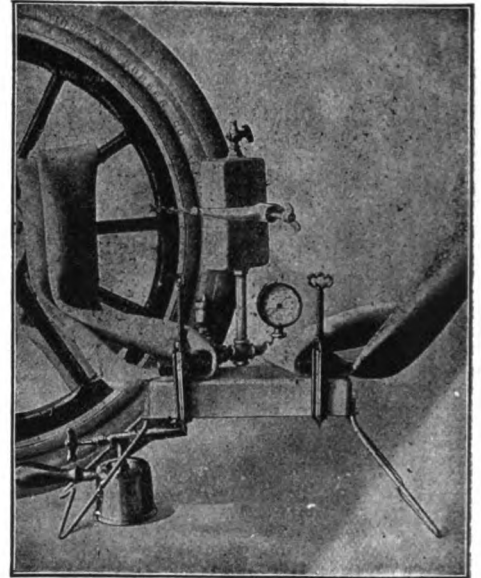
When you hand a can of "REX" over your counter you may be assured that you will have made a friend and a customer. "REX" covers a wonderfully large surface—that spells economy. It can be rubbed and polished while moist—that's a saving of time. Automobile owners are using "REX"—they say it's the only metal polish for motorists.

Let us send you samples, then test it yourself—we feel sure that "REX" will find a place in your day's sales "right away."

Guarantee "REX" fully—we will stand back of every proper claim you make.

ARMIGER CHEMICAL CO.
2150 AUSTIN AVENUE, CHICAGO, ILL.

The Pittsburg Portable Steam Vulcanizer



For the Owner or the Garage

Weights less than ten pounds. Can be carried in the tool box and used on the road, in the house, or in the garage. Steam generated in five minutes with gasoline or alcohol, or with natural, artificial or acetylene gas. No experience required to make repairs to both inside and outside of casings, or punctures and blow-outs in inner tubes.

Ten-day Trial Proposition

Sold with a Money-back Guarantee

By means of our Inside Tire Vulcanizer, a blowout or section ten inches long can be repaired with one-half the material used by the average repairman, and the repaired part will be stronger than any other part of the tire.

WRITE FOR BOOKLET and PRICES.

Motor Tire, Repair & Supply Co.

5858 Baum St., Pittsburg, Pa.

A NEW SET OF BRAKES

Would make YOUR car doubly efficient—and surely much safer. Why not get a set of the famous

DUPLEX EXTERNAL BRAKES

They act instantly, with slight pressure, and they act whether your car goes forward or backward. They are beautifully constructed of the best material money can buy.

We are brake experts. We can meet every brake requirement. We can give you just what you want. Write us. We'll be glad to tell you what a set of DUPLEX Brakes cost for your car. In any event, get our interesting booklet on Brakes.

THE ROYAL EQUIPMENT CO.,

450 Housatonic Ave.,
BRIDGEPORT, CONN.



TIRES. TUBES. TIRES.

STANDARD MAKES.

Highest grade stock, comprising of the best manufacturers. Cannot advertise names on account of the reduced prices we are selling them at.

Every tire is guaranteed brand new, perfect in every respect, and are not more than six months old. Some of these have the names of the makers on and others are buffed.

We thoroughly examine and test every tire and tube under heavy pressure to detect any weakness before shipping.

These are not the kind usually advertised. Nothing but the best stock is quoted in this ad.

Casings to fit Clinchers, Quick Detachable or Dunlop Straight Side Tires.

Size	Casing	Tube	Size	Casing	Tube
28x3	\$9.50	\$3.50	35x4	\$22.00	\$5.25
30x3	10.75	2.75	36x4	19.50	5.40
32x3	10.50	3.00	37x4	22.50	5.75
28x3½	12.00	3.00	32x4½	20.00	5.50
29x3½	14.50	3.15	38x4½	28.00	5.60
30x3½	14.50	3.75	34x4½	28.50	5.75
31x3½	15.00	3.75	35x4½	24.50	6.00
32x3½	15.00	3.90	36x4½	25.00	6.10
34x3½	15.75	4.15	37x4½	25.00	6.20
36x3½	15.00	4.25	34x5	20.00	6.00
30x4	16.50	4.60	35x5	25.50	6.25
31x4	17.00	4.75	36x5	26.00	6.50
32x4	17.50	4.90	37x5	28.00	6.75
33x4	19.00	5.00	37x5½	30.00	7.00
34x4	19.50	5.10			

Take advantage of these prices while they last, as we cannot guarantee how long these prices will stand good.

We guarantee these tires and tubes to be strictly 1910 and 1911 goods.

We are one of the oldest and largest tire and mail houses in the United States, and you do not have to hesitate to send us an order with cash accompanied, as we can refer you to any Commercial Agency or Bank in New York, as to our references.

We agree to refund your money if goods are found unsatisfactory upon receipt.

We Ship Goods Subject to Examination.

INSIDE TIRE PROTECTORS.



Prevent blow-outs, punctures, and greatly increase mileage. No need of throwing away old tires that are not worth repairing. Simply apply the inside tire protector and the old tire is given new life again and will add many miles of additional service. It covers the whole inside of casing to the head and is thus a blow-out patch extending all the way round. It is an acknowledged fact that 75% of all tires break down or blow out in the fabric before the rubber

is half worn out, thus losing half the mileage. These tire protectors are made from 3 to 6 ply of Egyptian fabric, with a self-seal flap reinforcing the rim and sides, always the weakest parts. We strongly advise placing these protectors in new tires, thus keeping them sound by releasing the strain, and the earlier a tire is equipped with them, the longer its life and the greater its mileage. Tube pinches are eliminated by the use of these protectors.

Order a complete set of them and save 100% on your tire expense.

Size	Reg. Price	Cut Price	Size	Reg. Price	Cut Price
28x2½	\$4.65	\$2.40	35x4	\$7.00	\$4.90
28x3	4.75	2.60	36x4	7.75	5.00
30x3	4.90	2.85	32x4½	7.25	5.00
30x3½	5.25	3.35	34x4½	7.50	5.10
32x3½	5.50	3.55	35x4½	7.60	5.25
34x3½	5.75	3.95	36x4½	8.00	5.50
30x4	6.20	3.75	34x5	8.10	5.60
31x4	6.25	4.00	35x5	8.25	5.75
32x4	6.40	4.20	36x5	8.50	6.00
33x4	6.60	4.40	37x5	9.00	6.50
34x4	6.75	4.75	37x5½	9.25	6.75

Owing to the fact that our profits are very small, we sell for cash only, and under no circumstances otherwise.

C. O. D. orders filled if 10% is accompanied with order, to show good faith.

Send for complete list.

EXCELSIOR TIRE CO.,

1777 Broadway.

New York City, N. Y.

ALLEN TYROMETER

TIRE PRESSURE GAUGE

PROPER TIRE INFLATION

More damage is done in half an hour to a tire that is not properly inflated than can be counted in 1000 miles of normal service.

Tires are built to meet certain requirements—they MUST be inflated to the proper pressure. Every tire maker will tell you that this is necessary.

ALLEN TYROMETER is just what you want. It is beautifully constructed, fits the vest pocket—4 1/2 INCHES LONG—and is absolutely accurate.

Just press it on valve and the pressure is immediately shown and held until you release it.

Note the phantom illustration. See the exquisite workmanship, the fine, strong spring, the large readable figures—a little masterpiece.

PRICE \$1.25

Invest in an ALLEN TYROMETER today.
At all dealers or from us.

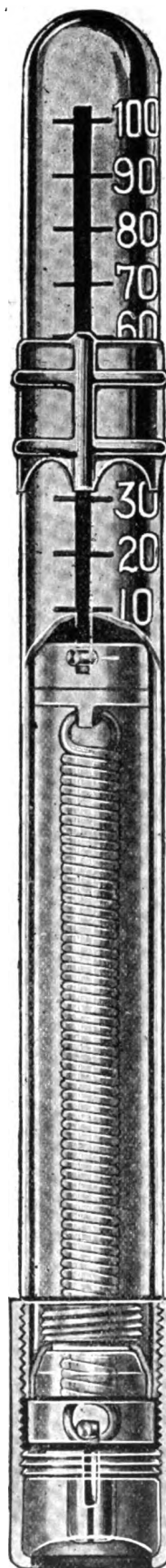
THE ALLEN AUTO SPECIALTY CO.

1926 Broadway, New York.

CHICAGO BRANCH FACTORY
1436 Michigan Ave.

BRANCH OFFICES:

O. Fenstermacher, Minneapolis, Minn.
Irvin Silverberg & Co., 335 Golden Gate Ave.,
San Francisco, Cal.



Please mention the Automobile Dealer and Repairer when writing to advertisers.

A Threading Outfit

that is suitable for general shop use—the 'DUPLEX' BOLT DIE STOCK SET "A," range $\frac{1}{4}$ to $\frac{3}{4}$ in. It contains dies that adjust without a wrench, and require no reversing when cut is finished.

ASK FOR CATALOG



A variety of sets with desirable ranges for A. L. A. M. and other standards of threads, are offered.

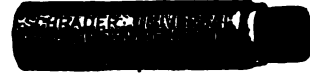
MADE BY

The HART MFG. CO.

1362 East 3rd Street
CLEVELAND, OHIO, U. S. A.

Mr. AUTOMOBILIST: Do you read the newspapers?

Of course we know you do. We only put the question to attract your attention. As you do read the papers and are fully posted on everything up-to-date that is going on, we wish to remind you of the articles which are appearing constantly in reference to correct air pressure in your tires. All the tire manufacturers are laying great stress on the importance of having tires pumped to the pressure that they advise, but in order to be sure you follow their directions you must have a good Tire Pressure Gauge.



The SCHRADER UNIVERSAL TIRE PRESSURE GAUGE

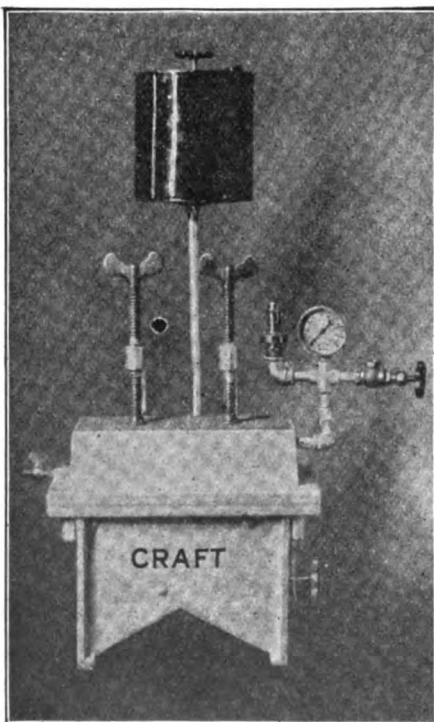
has been submitted to every tire manufacturer in this country and we have their written approval of it. In most instances they tell us they consider it the best Gauge on the market. We are making this Gauge just as carefully as our sixty-six years of experience in manufacturing brass goods has taught us and every one of our Gauges is backed by our guarantee, so if you are not satisfied with our Gauge you need not keep it.

The great distinctive feature of the Schrader Universal Tire Pressure Gauge is that the pressure Indicating Sleeve remains exactly at the place it has been put by the air pressure in the tire when the Gauge is applied to the valve, thus making it possible to read the Gauge after it has been removed from the tire. After the pressure has been ascertained push the Indicating Sleeve back into the Gauge by the pressure of your finger. The construction of the Gauge is such that the Indicating Sleeve cannot be pushed beyond the proper figures, through sudden admission of air under high pressure into the Gauge. This feature is of the greatest importance. If you buy a Gauge you want to get one that is going to be right at all times. This Gauge records pressures accurately whether it is used with the valve at the top of the wheel or at the bottom.

Ask your tire maker, jobber or dealer to show you how it works. If they have none in stock enclose One Dollar in an envelope with your address and the Gauge will be sent you immediately by

A. SCHRADER'S SON, Inc.,
28-30-32 Rose St., New York City
Descriptive circular on application.

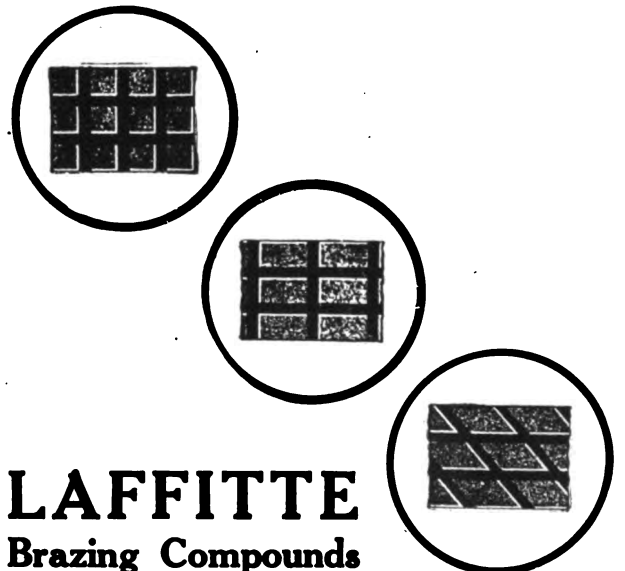
CRAFT Steam Inner Tube Vulcanizer



Two tubes every fifteen minutes and no danger of burning them up. Any break-up to the length of eleven inches in one cure. This machine will do all the tube work in any garage in the United States. Fitted to use with gas or gasoline and sold for \$25.00, cash, with your order. This vulcanizer is not sold through any dealer or jobber in the U. S., but sold from the makers only.

COMBINATION STEAM VULCANIZER CO.

304 East Forty-eighth St., MINNEAPOLIS, MINN.
Oldest Manufacturers of Vulcanizers in the Northwest



LAFFITTE Brazing Compounds

Encircle the entire field of brazing. A perfect braze and a positive saving of 83%. With Laffitte there is but one operation. all the necessary ingredients being contained in the one piece, including the proper proportion of spelter. No blistering, swelling or oxides. The Compounds flow quickly and freely, making a perfect and clean braze.

No. 1 for brazing brass, red copper and bronze
No. 2 " " red copper and iron
No. 3 " " iron and steel

SAMPLES FREE—on request.

The Phillips-Laffitte Co.,
Pennsylvania Building, Philadelphia, Penna.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

the hip rafters to join it at the top or comb. Underneath the piece B is hung a double angle steel hay track, E. The track is hung on bolts $\frac{1}{2}$ in. x 12 in. On this track is placed a small hay carrier, F, and to this is fastened a set of self-locking block pulleys, G. The complete truss serves as a joist and a set of rafters. The rafters are mitered to set on top of the joists and are placed directly over them.

Material Required and Cost.

6 bbls. cement	\$9.00
6 yds. sand .....	.60
685 cement blocks	68.50
3 bbls. lime	2.55

In making the estimate local prices are quoted. This will vary slightly in different localities.

The cement blocks used are $7\frac{3}{4}$ in. x $15\frac{3}{4}$ in. This size with the mortar joint fills a space 8 in. x 16 in. The size of the building and the arrangement of the doors and windows makes it possible to use whole and half blocks without having any odd sizes to work with.

The window arrangement throws the light where it is needed. The window sills and caps are molded from concrete at small expense.

By using the block pulley and carrier arrangement, one man can remove a heavy automobile body by raising it from the chassis and then running the carrier on the track to one side of the room where the body can be left

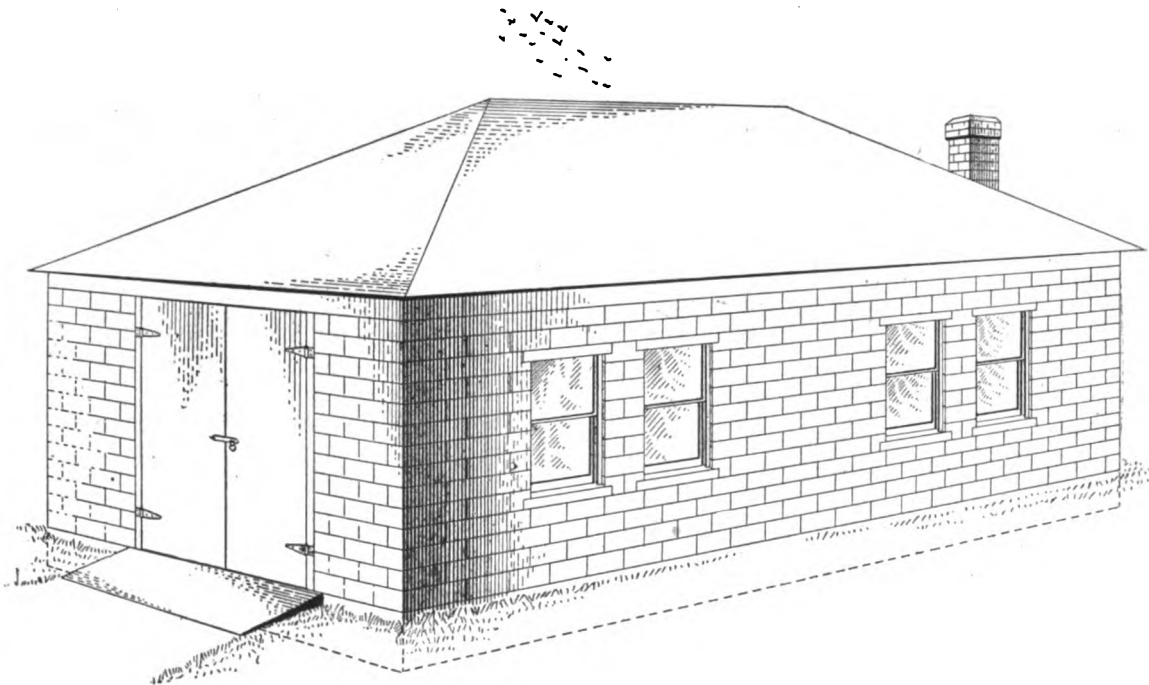


Fig. 2—Front and Side Elevations.

Brick	1.40
Lumber, 781 ft.	13.15
600 ft. sheathing	8.40
For turntable (oak), 263 ft.	5.26
147 ft. of cornice	3.67
100 ft. matched flooring for door	2.20

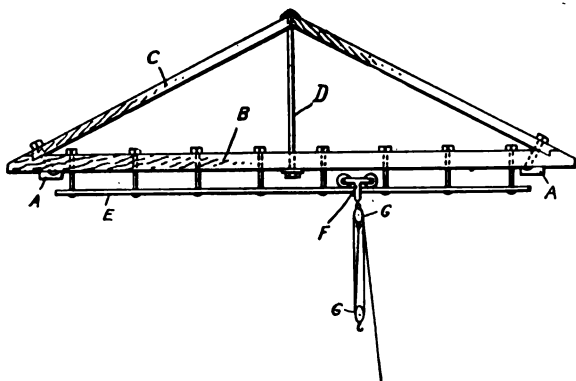


Fig. 4—Truss.

10 windows with frame	27.50
Door frame	1.00
12 ft. hay track	1.20
Bolts .....	.50
Carrier and pulleys	4.00
6 squares galvanized steel roofing	22.50
Labor	75.00

Total\$247.53

on trestles. The block can then be used to lift other parts of the car.

The pit furnishes a means of getting at parts underneath the car without "sliding in on the back."

The turntable furnishes a means of turning the car in any direction to wash or repair it and also does away with backing the car out of the garage.

The flange pulleys can generally be procured from some junk pile at a cost of a few cents. The track for table can be made of old wagon tire.

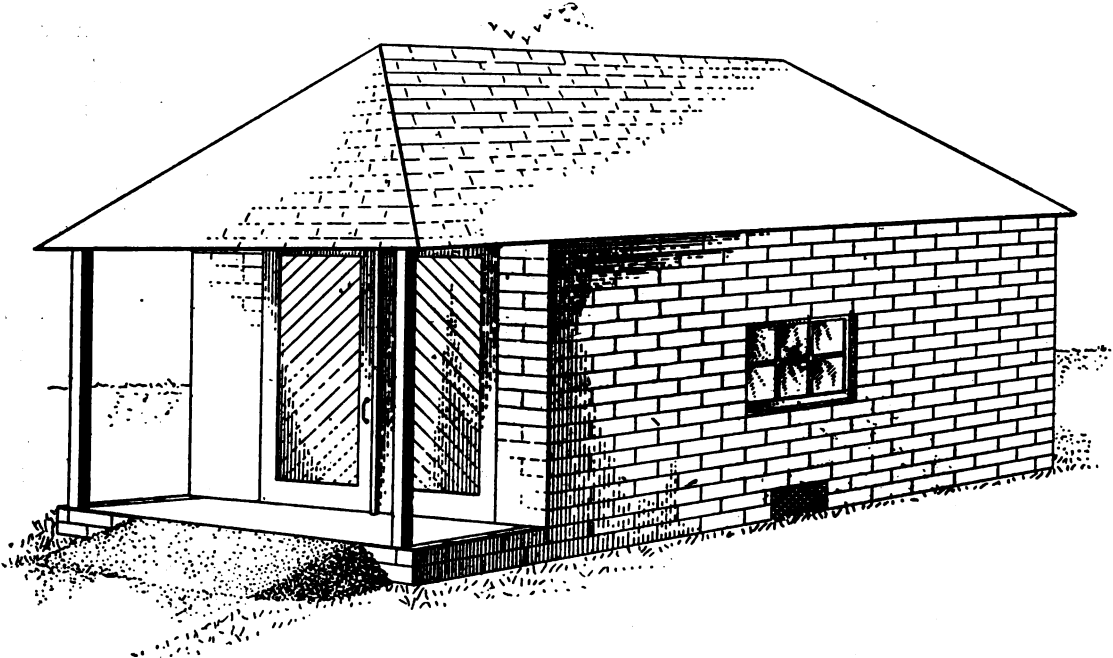
The hydrant and gasoline tank are not included in the estimate. These may be placed at any convenient point. A good place for the gasoline tank is to bury it just outside the door. The pipes can then be run inside and the pump placed where it will be most convenient.

Another Inexpensive Garage.

From D. W. Pierce, Indiana:—To build this garage, stake it off 14 ft. 8 in. x 16 ft. 8 in. Dig a trench about 18 inches deep. Let it extend up on each end of the porch; tamp it in with sand. Start the brick wall 3 or 4 inches below the ground or the rats will dig under. Build 8-inch wall, 6 inches above ground. Make a frame 14 ft. x 16 ft. out of 2 x 8 inch studding. Put it on the wall so one brick will build up outside of the frame. Dig a place 3 feet deep under the trap door. Put in your joist. Lay the floor and put up 2 x 4 studding 8 feet high. Set them flat with walls and space for doors and windows. Put on 2 x 4 plate; box it on the outside. Make the window and door frame out of 2 x 6 stuff and nail flush with studding on the inside. They

will stand out about 3 inches to hold the brick. Build a brick wall 4 inches, one brick thick outside. Drive nails into the building every six bricks high, close to the brick, letting them stand out $2\frac{1}{2}$ inches, that will hold the wall to the building. Let the wall come flush with

will not require much paint. It would be fireproof from the outside by putting on a tin roof, but would cost some more. I figured on block brick. They are 4 in. x 4 in. x 10 in., and should be rocked-faced. It will take 3-inch small bricks, if they are used instead of the block brick.



Showing the Porch.

the top of the plate. Put on another plate out of 2 x 6 stuff, flush with the outside of the wall, letting it project four feet in front for the porch. Put up porch posts, and put a 2 x 6 plate across the front. Put a 2 x 8 piece under the plate at the porch. Now put on

You will find the porch in front will protect the doors, and you can also hook them to the posts with small hooks, which will hold them open. The floor of the porch should be level with the floor inside, so you will have more room to stop your car. You can put things over the porch from the inside. I think it will well pay for the little it costs.

Cost of Material.

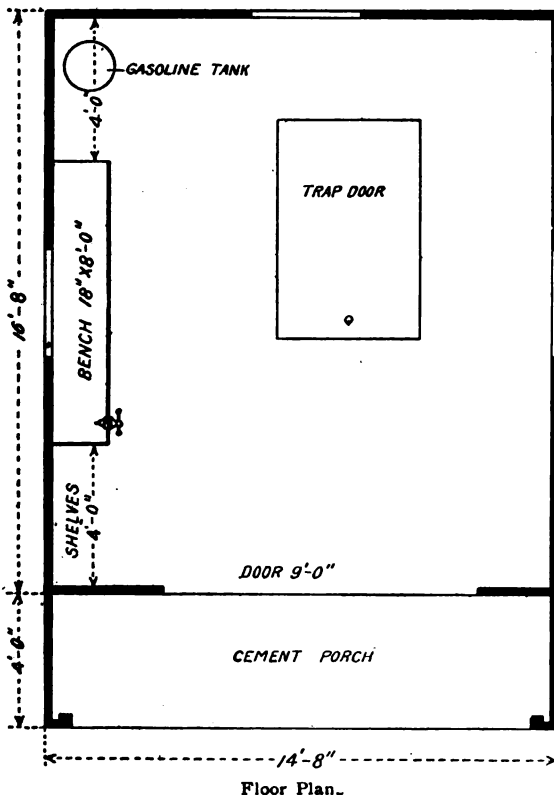
1,500 feet of lumber at \$11 per thousand.....	\$16.50
Cost of studding, rafters and plates.....	14.34
Sheathing	6.00
3,500 shingles	14.00
Pine floor	5.40
Doors, ceiling, work bench, etc.	16.56
Cement, lime, sand, etc.	7.36
Carpenter and brick work.....	25.00
Nails, hinges, paint, etc.	6.80

Total\$106.80

This house could be built for less than \$100 in this locality, for I figured the lumber at \$2 when I can get all the rough lumber at the saw mill at \$1.50 per hundred feet.

Steering Gears.

There is no part of a car that should be kept in better condition than the steering gear. If the road wheels are not inclined to answer readily to the steering wheel, one naturally looks first to the pivot joints, tires, or the wheels themselves, but oftentimes the trouble remains unsolved. Recently with a car of the first grade the fault was found to lie with the near front springs. An inspection showed that this spring was somewhat weaker than its fellow, besides which it had moved backwards out of its original alignment at a slight angle. This caused the wheels to swerve from side to side, so that it was next to impossible to keep a true course. A new plate and a readjustment was made and the trouble ceased.



Floor Plan.

the roof, make the doors, put in the sash so they will slide up, and you will have a warm building in winter and cool in summer. It will not sweat and rust your engine. There will be no dust blowing in at the cracks. This building will not cost much in the long run for it

LONG OR SHORT STROKE.

The More Common Design Finds an Able Defender in Mr. Pembroke.

From C. J. Pembroke, New York:—The average automobile user has obtained more real knowledge from reading the various articles that have been published in the trade journals than from any other source, so for this reason, even though an article may be written in a rather one-sided, radical, or even in some minor respects, erroneous manner, it is better to let it stand as printed, than to be printing one thing this month and then telling the readers that it was all wrong the next. Still there does come a time in which the statements made are so far from the real facts that to let them be accepted by the novice as true without a single word having been raised in contradiction would do a great injury.

Then this article may have been contributed by some regular writer, or by some advertiser whom they do not wish to offend, or it may have come from a source that was known to be generally reliable and so could not avoid publishing it. Whatever may be the reason for its publication, I believe that any of them are at all times ready to publish the views of others that may differ and then let the reader form his own conclusions as to which is the more sound argument, so I am going to point out wherein I differ with Mr. Meyers, in a paper read before the "New York Society of Automobiles" as published in the March number.

In the first place he goes on to show us the different dimensions of the various motors that he has built. I am sorry to say that the only reason that I can see for agreeing with his advocacy of the long stroke motor is the simple fact that he is building them, and that his reason for doing so is because he has had better success with his longer stroke motors, because he has built 45 long stroke motors to 3 that were square, while he has never built a motor that was of shorter stroke than bore. He does not tell us what compression he used in these various motors, neither does he tell us the size of the intake valves, the exhaust valves, the intake or exhaust pipes, form of ignition used, or even the piston speeds of any but two of them. Why did he not take two motors of the same bore and then show us why the longer stroke was better, but instead of this he takes a 11x15 and a 10x18 and right out of the box he hands us the fact that the larger 10x18 weighed 1500 pounds less, which was a complete acknowledgment that the worst possible designing was used in the 11x15 or else the 10x18 must have been dangerously light in construction and if the 11x15 was so poorly designed as to eat up all its own power it is no wonder that the better designed 10x18 showed so much more efficiency. Had he gone further into detail we would probably have found that the valves, pipes and other features of the latter engine were larger and that the compression was greater, then if the same carburetor and ignition were not used on the two engines, the test was of no value, because the greatest advances in motor construction in the past ten years have been in carburetion and ignition, for you must concede to me that the form of cylinders, pistons, connecting rods, etc., are the same to-day as they were some ten years ago when the engines were giving all kinds of trouble.

Why did he not pick his 5x5 and his 5x6, and show us with the same compression, carburetor and ignition the difference in power, weight, etc.? I don't see

anything interesting in the fact that when the length of stroke was increased the size of the crankshaft was reduced, because it either showed that the crankshaft in the shorter motor was altogether too large or that the reduced one for the greater leverage was not going to last very long. His crank-pin for the 11x15 motor was $7\frac{1}{2}$ inches from the center, while in his 10x18 the crank-pin was 9 inches from the center. Should you be handed a 7 inch wrench and a 9 inch wrench, with which one could you twist off the same sized bolt the quickest, by using the same pressure on the end of the wrench? The main bearing on the crankshaft represents the bolt, the crank web represents the wrench and the piston pushing through the connecting rod to the crank-pin represents the pressure that you would apply to the end of the wrench. You can see that had the bore been the same, together with other conditions, with only the longer stroke to be considered, his crankshaft to have been proportionately strong would have had to be larger, instead of smaller, as 9 is to $7\frac{1}{2}$.

He says that after ten years' service it has proved more durable and cost less for repairs. This statement only goes to prove that sufficient metal was used in the longer engine and that the shorter one that weighed so much more was not only eating up its own power, but was tearing itself to pieces, oscillating and rotating this enormous extra weight.

Because he has found that some of his engines produce their power more efficiently at one piston speed than another, instead of going to it and finding out the reason why this was a fact with his cut and try motors, he simply says that all the laws of mechanics that have governed us for ages, and that will continue to govern us for ages to come, are wrong.

Now bore for bore or stroke for stroke the power will be greater as we increase the speed of the piston, and in any portion of the range of speed the economy will be the same so long as the gases remain in the same state of perfection as to mixture and the ignition, valves, pipes and other parts also perform their functions in an equally efficient manner, and if an engine at a lower speed than that of safe lubrication shows a better efficiency as to fuel it simply shows that it is the speed at which the carburetor delivers the most economical mixture, or it is the point at which the size and timing of the ports show their best action.

He gives five reasons why the long stroke motor is advantageous, and they are all based on a comparison of this heavy cumbersome 11x15 motor as compared with the better designed and lighter built 10x18, in which case any statement might be perfectly true. But of two motors of the same bore the one of the longer stroke, (assuming that other things are equal) will weigh more and will require more radiating surface. And so we might as well add that it will not be so economical by reason of the loss of these heat units as well as by the extra load that must be carried around to furnish this extra radiation if the engine is to be used in an automobile (which is the only purpose that is to receive consideration here as this is an automobile journal and is supposed to be read by auto users). We cannot concede that one would be of longer life, but must acknowledge that the long stroke motor would run with less noise and in a smoother manner, just the same as our short stroke motor would run smoother when doing but half speed, but this is more than offset by the fact that in auto use it would be necessary to gear the car up in proportion to the amount that we lengthened the stroke, thus

having slowed down the motor to maintain the safe point in piston speed.

He goes on to say that it would be poor designing if the designer could not take a 4 in. x 4 in. motor and make it 4 in. x $5\frac{1}{2}$ making a motor of but 5 to 10 per cent. heavier and get a gain of 25 to 30 per cent. in power. Let us take this as an example and see how he would finish. In the first place, to have equal compression, the four inch stroke would have a compression space of 1 inch and a stroke of four inches making 5 inches in all, while the $5\frac{1}{2}$ inch stroke would have a compression space of $1\frac{3}{8}$ inches and a stroke of $5\frac{1}{2}$ inches making $6\frac{7}{8}$ inches in all or in other words, the cylinder would have to be $1\frac{7}{8}$ inches longer, likewise the water jacket. The piston should be as long as the stroke so there would be $1\frac{1}{2}$ inches more piston, and the connecting rod should be at least twice as long as the stroke so there would be 3 inches more connecting rod. The crankshaft should be larger in proportion to the amount that the crank has been lengthened so the crankshaft would have to be larger, as $5\frac{1}{2}$ is to 4. Now the entire crank-case would have to have a diameter for its entire length of at least 2 inches more and it would take more oil to fill it so that the cranks would reach it, and as it would be a longer lapse of time between strokes the fly-wheel, would have to be heavier to carry the piston over the idle strokes with the same degree of smoothness. Now let us figure the horse power of these two motors and see what he gained for his trouble (figure them by any formula that you wish, but I am going to use one that takes into consideration the bore, stroke, revolutions per minute and the number of cylinders so as to show up any gain that he might have had by lengthening the stroke). Let us take the 4x4 first, and in both engines we will assume that we have a mean average pressure of 70 lbs. per sq. in., and that both exhaust valves open at 5-6 of the power stroke. Now square the diameter of the bore and we have 12.566 sq. in.; multiply this by the average pressure of 70 lbs. and we get 879.62, total average pressure on the piston head; this multiplied by the stroke of 4 inches gives us 3518.48 inch pounds per power stroke. Divide this by 5-6, which is the proportion of the power stroke at which the exhaust valve should open, and we have 2932.067 as the net inch pounds. This divided by 12 gives us the foot lbs. which is 244.339. Multiply this by the number of revolutions at which the piston speed will be 1,000 feet per minute, which is 1,500, and then by the number of cylinders, say 4, and we get 1,486,034.000. Divide this by 2, as we only get a power stroke every other revolution, and we have 743.017, and then divide by 33,000, the number of foot pounds per horse power, and we find that this motor should develop just 22 h.p.

Now take the 4x $5\frac{1}{2}$, and by squaring the bore and multiplying by the average pressure, we will have the same as in the former case, 879.62 lbs. average pressure on the piston head. This multiplied by the stroke of $5\frac{1}{2}$ inches gives us 4837.91 inch pounds per power stroke. Divide this by five-sixths which is the proportion of the power stroke at which the exhaust valve should open and we get, 4,031.590 as the net inch pounds. Divide this by 12, gives us the foot pounds as 337.625. Multiply this by the number of revolutions at which the piston speed will be 1,000 feet per minute, which is 1,090.909, and then by the number of cylinders which is 4 and we get 1,473,272.604. Divide this by 2 as we only get a power stroke every other revolution and we have 736,636.302 and then divide by 33,000, the number of foot pounds per horse power,

and we find that this motor also will develop just 22 h.p.

He still goes to further state that it takes more power than is gained to turn up the 4x4 motor to the necessary speed to show equal indicated power. But the long stroke motor must push a heavier piston and connecting rod through a 1-3 greater arc, it must turn a 1-3 larger crankshaft handling both the greater weight and the extra friction, it must swing a 1-3 larger clutch, turn a 1-3 larger drive shaft and use a 1-3 higher gear to get the same speed at the wheels, thus requiring a larger and heavier rear axle housing, a heavier frame to support all this extra weight, and in the long run it will be found that the greater efficiency between the actual power delivered at the wheels and the indicated horse power will be very much in favor of the high speed motor. The very existence of the automobile is due to the high speed motor. Take his own figures if you will and he shows that his 22 h.p. slow speed motor could be reduced 1,500 lbs. and still leave a better engine, but also please note that this better and more efficient motor was of greater speed, but everything taken into consideration his 11x15 slow speed motor must have weighed at least 3,000 lbs., and with other parts made to support it and use its power, the automobile that could have had an engine of this type would have weighed something like six or seven tons. Now by his own statements he was compelled to reduce his weight and increase his speed to make a gain in power and still he shifts his position to suit his arguments and deliberately says that we lose more by friction than we gain by speed, so I suppose that a motor that was standing still would develop more power than one that was turning up 1,000 R. P. M.

He claims that a smaller bore in a long stroke motor will produce the same power at the same piston speed, but I have taken the trouble to figure out for you that there is nothing in his theory than can be supported by figures or even mechanical reasoning.

You can plainly see that he acknowledges that the long stroke motor of equal bore will waste more heat units to the water jacket and he goes into some correct mechanical calculations to show this. But before we go any farther into this discussion I want to say that for a stationary engine that is to be used on a foundation simply to deliver power to a line shaft a great many of the parts that must weigh more, represent good features as they tend to steady the motor and reduce vibration, also when they do not have to be moved around by the power of the motor itself as in automobile work they subtract nothing from the efficiency of the motor, and in this manner they more or less justify their use. Simply figuring on the torque delivered to the crankshaft rather than on the amount of power delivered to the wheels, nor would he have considered how much of this power was wasted after being delivered to the wheels by pushing along this extra weight.

He says that the compression can be carried higher in the long stroke motor without any of the faults of too high compression; that increased compression is another step toward more economical operation. If I simply wanted to say something for the sake of hearing myself talk, I might tell you that water would boil in a long boiler at 100 degrees but that in a short boiler it took 212 degrees of heat. I might also tell you that with two boilers of the same capacity the steam coming from the shorter one of the two would cool off so much more rapidly before it reached the engine, even by using the same size and length of

pipes, that the pressure would be reduced one half. I might also say that 200 lbs. of steam pressure as against 100 lbs. of steam pressure would not show an equal gain in pressure at the engine because the friction of the greater pressure passing through the pipes would more than consume the difference in pressure at the boiler and by the time that it reached the engine this 200 lbs. would be reduced to less than 100 lbs., and that from lack of friction the 100 lbs. boiler pressure would be increased to 200 lbs., and even at that I would not be making statements that were any further separated from accepted mechanical practice than are some of the statements contained in this article. The facts are that the compression can be carried just as high in one engine as in another; that is up to the point where the heat of the compression will ignite the charge, this point being the same for all engines. If it were not for the fact that pressure is heat and that heat is pressure, then there would come a time that the compression could be carried so high that the power from the preceding power stroke would be unable to carry the piston over, due to lack of energy caused by making the two non-power strokes in the meantime, both of which also consumed power in friction and doing the work of exhausting and sucking in the new charge. Under this condition the compression could be carried higher in the short stroke motor, but why discuss the impossible, when we can give facts?

I am driving an automobile that has a 4 cylinder, $5\frac{1}{2} \times 5\frac{1}{2}$ motor. The compression is 109 lbs., which I think is as high as anyone would want. This motor has driven a car that weighs 3,900 lbs. for four years having done over 60,000 miles and is to-day in first-class condition and will take this heavy car over any hill that I have ever had reason to negotiate on the high gear and do it without giving you that feeling of wanting to push on the steering wheel. Now while this engine carries what I would call excessive compression, it has never to my knowledge showed any signs of a too high compression, at least I cannot see any of the ill effects, such as preignition knocking or back firing, overheating, etc.

In nearly every paragraph he makes assumptions, but he does not give a single mechanical calculation, knowing that not one reader in a thousand would be in a position to test these things out for themselves.

He calls your attention to what the advocate of the short stroke motor will say and then tells you that the principle of increasing the speed is all "tommy rot," if you hope by so doing to increase the power, for although in the very next breath he says "it will be found that the actual pull in pounds will increase with the speed of the motor up to a given point, when the pull in pounds will begin to decrease." Now he should have explained this statement by saying that the pull in pounds will increase until the efficiency of the ports is no longer capable of handling the gases, or that the ignition is no longer capable or properly igniting the charge, after which time due either to lack of gas, or for want of getting rid of the burnt gas, or for the want of better ignition, the pull in pounds will decrease. But kind reader, the short stroke motor advocate is not bothered in this way any more than is the long stroke, except as to ignition, and to-day we are not bothered in this respect, because they have so perfected the ignition that it will work much faster than the fastest safely lubricated engine in the world. As far as size of ports, speed of the gases, etc., are concerned, they, like the power, are always the same for both, at the same piston speed, because as I have

shown to you the long stroke motor uses twice as much gas per stroke as does the short stroke, but on the other hand it has just twice the time in which to handle it, as the short stroke motor takes in one-half the amount but twice as often.

He says that the exhaust valves do not need grinding in as often with the long stroke motor, as there is not as much heat passed out through them as in the short stroke motor, and in this I agree with him, but I do not agree as to the cause for the lesser amount of heat, for he explains it by saying that the long stroke motor reduces it by the longer movement of the piston and I have shown that it takes, in a motor of twice the stroke, twice as long to get rid of twice the gas, and if it were not for any other reason than that of piston movement the pressure, quantity and speed of the exhaust gases would be the same for both motors, but the real reason for a lesser quantity of the burned gases passing out the exhaust, is, as stated, that this amount that represents the difference passed out through the cylinder wall to the water jacket cause overheating trouble, which is worse than grinding in the valves now and then.

After going on to show you how fast the heat from the expanding gases can get through the cylinder wall, he says: "If we were to tell him that it would take less than two seconds, he would either not believe it or at once begin to realize what high piston speed means when it comes to a question of economy. It is thus seen that when we increase the piston speed there is less time for heat to be carried off through the cylinder wall and as a result more of it is converted into work." Now he saw that he was boosting the high speed short stroke motor and tried to qualify by saying, "when this is done by means of increasing the stroke." Now when I think of a long stroke motor, my mind always at the same time couples with it slow speed, and when I think of a short stroke motor my mind always couples with it high speed, both of the piston and the R.P.M. But however it may strike you, if high piston speed is good for a long stroke motor it should also be good for the short stroke, more especially as short stroke and high speed always have been close friends and for this reason should not be torn away from the other when it comes to piston speed.

When I go into a big manufacturing plant and see a big, lazy, slow moving gas engine turning thousands of wheels and performing a tremendous volume of work I cannot but realize that it is producing a great amount of power. When I go to a hill climb and I see a small, light, rapid moving high speed motor and I can hear its roar above all other noises, and I realize that it is taking a car that weighs several hundred pounds and hurling it up to the top of a steep, half-mile hill, in seconds not minutes, I cannot make myself believe that it has no power due to having consumed by its own friction all that the heat of the gases had produced. But on the other hand I realize that here we also have a great volume of power, and it is then that I quietly say to myself over and over again: Heat is pressure and pressure is heat. That power is speed and that speed is power, and so I for one will go right along and pass over this tidal wave of long stroke motors that was threshed out some fifteen or twenty years ago. I would not want an automobile equipped with a motor, carburetor or ignition outfit built similar to what was the best known practice of twenty years ago, as even the thought of it brings vividly before my mind the hot tube ignition and the tank carburetor and I can see anchored to a stone

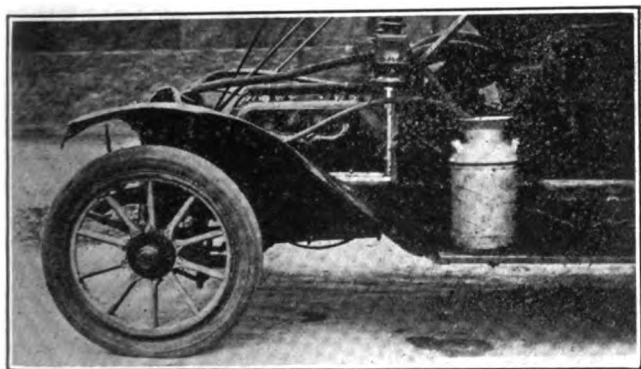
foundation tons of iron in the shape of an engine, with a motion about like that of a snail.

I am not building engines of any kind for the trade, neither am I interested in a financial way with any part of the automobile industry, so I am not trying to sustain any predetermined position or to feather my own nest, but cannot resist the temptation of stating what I firmly believe to be true after having read that which I equally believe to be wrong.

To show my exact position as to motor construction will say, that I am making preparation at the present moment to spend several thousand dollars in the construction of a motor for a 100 ft. power yacht that I hope will make at least 35 miles per hour, which motor will be designed by myself, built in my own shop and will consist of 24 cylinders, 4 cycle. Now take notice, 8½-inch bore (Did you notice that I said bore not stroke?), with 5-inch stroke, so you see the bore is greater than the stroke, while the R.P.M. will be 1,200, so you see that it will also be of the high speed type. The intake pipes, exhaust pipes, carburetors, ignition outfits and other parts will be arranged in series of four cylinders each, so that this will divide the motor up into practically six motors of four cylinders each, except the crank-case which will be divided into three sections of eight cylinders each. Now instead of this engine eating up all of its own power by reason of the internal friction created by the high speed indicated, I hope to have it deliver at the propeller 675 horse power and I am willing to gamble the several thousand dollars that it will cost on the results.

A Milk Can Radiator.

His car was deprived of its radiator by an unexpected encounter with a switch engine, so J. Fred Brown of Martello, Iowa, had to substitute a milk can. His car was struck by a Milwaukee engine as Mr. Brown was driving across the tracks in his home town after a long freight train had passed. The radiator was torn completely away, both lamps were destroyed and the hood



Mr. Brown's Radiator.

was so badly wrecked that it was discarded. Careful examination revealed that the motor had not been damaged. The motor would run, but there was no place to store water for cooling purposes.

Mr. Brown was not long in debating the subject. He secured a large milk can, and after filling it with water placed it on the right step, wiring it securely. With the aid of two pieces of garden hose he completed his "latest invention." One piece of hose was attached to the intake pipe and run to the milk can, and the other one was fastened to the exhaust and extended to the milk can. After packing his suit case he set out for Moline, Ill., and arrived without further mishap.

His arrival at the Velie car plant attracted unusual in-

terest. Heads of departments and mechanics gathered around the car to look it over and to comment on Brown's unique idea. Exclamations of surprise were heard on all sides and the chief engineer was forced to admit that it was a new one on him. The car is now in the plant undergoing repairs.

FORTY IN A SECOND.

What a High Speed Motor and a Carburetor Must Accomplish to Be Effective.

From Sydney F. Walker, England:—In the previous articles, the writer has dealt with the different factors, "independent variables," as mathematicians call them, entering into the problem of carburetion. He pointed out that carburetion consists in the breaking up of the gasoline into very minute particles, their absorption by the air current flowing past the carburetor nozzle, the charged air current passing on into the cylinder. He pointed out that the ability of the air current to carry gasoline vapor, as it becomes, increases with the temperature, and very rapidly when the temperature reaches a certain figure. He also pointed out that the quantity of gasoline which is sucked into the cylinder by the air current, depends upon the injector action of the air current passing over the carburetor nozzle; this varying directly with the velocity of the air current. He also pointed out that the flow of air through the carburetor, depends upon the difference of pressure between the outside atmosphere, and the cylinder into which the charged air current is to pass. It will be noticed that in all of these, the tendency is to increase the quantity of gasoline vapor moving forward, as the speed of the engine increases. Increased speed of the engine means an increased number of explosions, and that means increased heat in every part of the apparatus, including the carburetor, this leading to easier evaporation, and a higher temperature of the air passing over it.

Decreased viscosity, it will be remembered, was pointed out as increasing the rate of evaporation, and decreased viscosity would rule with the higher temperature following upon the increased number of explosions. The increased number of suction strokes per minute, also leads to an increased velocity of the air past the carburetor nozzle, and to increased injector action. There is another point that should be mentioned, the increased temperature in the neighborhood of the carburetor leads to expansion of the air, and therefore to a decreased quantity finding its way into the cylinder, though at an increased velocity. It was mentioned that according to some experiments made in the United Kingdom, when gasoline engines are running at a very high speed, 1,500 revolutions per minute, the actual quantity of air taken at each suction stroke, is only half a cylinder full. This is apparently a little puzzling, in view of the fact that the air is moving at increased velocity. It must be taken as an experimental fact. What engineers, if they are wise, look out for most is facts. Upon actual facts can be built principles leading to the prediction of other facts. The difficulty is always to ensure that the facts are reported correctly. The difference is illustrated diagrammatically in Figs. 1 and 2.

What is An Explosion?

It may be well to turn aside for a moment to ask what is meant by an explosion. It will be remembered that the action of the gasoline engine, in common with all internal combustion engines, differs from that of the steam engine in the manner in which the piston of the engine is propelled. In the steam engine, it is more or less of a push. Where steam is not used expansively, it is a push pure and simple. Steam is coming away continu-

ously from the boiler; that in the steam chest is pushing the steam in the steam pipe, and that is pushing the steam in front of it, and so on, until the last lot of steam pushes the piston in front of it. Even where steam is

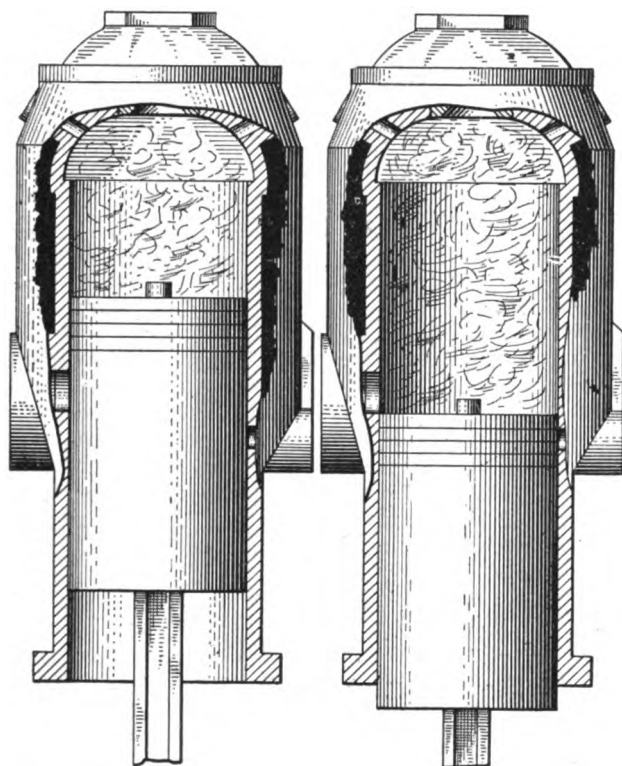


Fig. 1—Showing diagrammatically a half cylinder full of gasoline vapor and air.

Fig. 2—Showing diagrammatically a cylinder full of gasoline vapor and air.

used very expansively, the action is more in the nature of a push. In the gasoline engine, the piston receives a violent knock, as distinguished from a push. The difference is as great as between the action of pushing a man gently out of your front door, and knocking him down the steps. The question however naturally arises, what do we mean by an explosion. Everyone is familiar with the fact that ordinary illuminating gas burns harmlessly as it issues from a jet, but if allowed to escape unburnt into an unventilated room, and the room be entered with a light, an explosion occurs. What is the difference between the gas burning freely and harmlessly at the jet, and that when it explodes violently. The two actions may be seen in the older forms of gas engines, where a gas jet is used, either for flame ignition, or for tube ignition; and again in some of the oil engines, where a lamp is employed for ignition. The flame burns freely, without noise, and without damage, while the gas, oil, or gasoline inside of the cylinder, burns with violence and noise. We know that we can count the strokes of a gasoline engine, if we have a certain amount of experience, either by the explosions, or the puffs at the exhaust. The present writer once defined an explosion in connection with mining work as follows: An explosion occurs when a mixture of gas and air, which at one instant occupies a very small space, at the succeeding instant tries to occupy an enormously increased space. This applies to the gasoline and other internal combustion engines, and also to the rifle, the cannon, etc. In all of them the mixture of gas and air, or the powder charge, occupies a small portion of the working cylinder, at the instant before ignition. Immediately after ignition, the mixture, which has meanwhile changed its nature, seeks to occupy the largest possible space it can command, and

in doing so, forces the piston violently to the front of the cylinder, or the bullet or shell violently out of the mouth of the rifle or cannon. Figs. 3 and 4 show this diagrammatically. A little further examination will show, that what we term an explosion is merely a certain high rate of combustion. The writer believes that no measurements have been taken to determine at what rate of combustion, what may be termed explosive violence sets up. One important requirement, however, is common to all cases of explosion; the explosive mixture must contain definite proportions of the gas and air. With mine gases, or ordinary illuminating gas, the proportions of gas and air required for explosive violence must be between 5 and 15 per cent. That is to say, there must not be less than 5 per cent. of the gas present, nor more than 15 per cent. If there is less than 5 per cent. present, ignition will take place, but the rate of combustion will not be sufficient to cause explosive violence; and similarly, if more than 15 per cent. is present, explosive violence is not reached. With gasoline, the required proportions are very much closer; viz., between 2 and 5 per cent. And here comes in one of the difficulties that, as it appears to the writer, may arise when running at very high speeds. It appears to him that under certain conditions, it may be possible for more than 5 per cent. of gasoline vapor to be present in the cylinder, and then no explosion can take place; or what probably does take place in a great many places may happen, a portion of the mixture may be ignited, a certain amount of combustion following, the remainder being blown out through the exhaust, and possibly leading to the explosions in the muffler mentioned in a previous article.

If we consider the matter a moment, we shall see how difficult the problem is. Take a speed of 1,200 revolutions per minute, which is not the top speed at

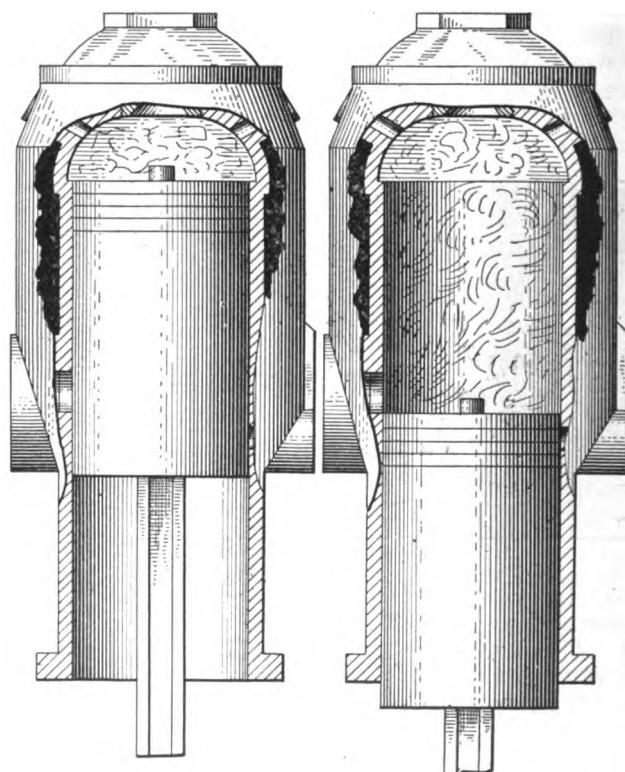


Fig. 3—Showing diagrammatically the charge under compression.

Fig. 4—Showing diagrammatically the charge after compression.

which engines sometimes run. It is taken for convenience in calculation. This means 2,400 individual strokes of the piston per minute, or one-fortieth of a second of time for each stroke. During this very short time,

which is almost unthinkable, a number of operations have to be performed. The inlet valve has to be opened, its inertia being overcome; the inertia of the gas and air lying in the spaces beyond the inlet valve have to be overcome, or as is more probable, the motion in the opposite direction has to be reversed. The gasoline has to be sprayed, carried forward into the engine. In another one-fortieth of a second, such mixing as can be accomplished by compression, has to be done.

It will be remembered that the reason why higher efficiencies are obtained with compression, and greater powers with a given quantity of gasoline vapor or gas, is, because the compression causes a certain amount of mixing; it enables the individual atoms of carbon and hydrogen, into which the molecules of carburetted hydrogen gas are split up, to obtain the atoms of carbon they require for combustion. The higher the compression, within certain limits, and subject to certain qualifications, the greater is the mixing effect, and the better is the combustion.

It is now well understood that combustion, even in gasoline motor car engines running at the high speeds mentioned, is not instantaneous in the chemical sense. A certain quantity of the mixture is ignited, a certain amount of heat being liberated by its combustion; the heat so liberated decomposes a further quantity of the carburetted hydrogen gas, further combustion taking place, and so on. It is worth noting also, that the whole of the chemical actions required, and they are many, have to be accomplished within the one-fortieth of a second. The gas has to be mixed with the air, it has to be decomposed, its components have to reunite with oxygen, and the necessary expansion of the products of combustion has to take place, and all within one-fortieth of a second.

The writer has purposely not dealt with complications such as opening the inlet valve a little before the commencement of the suction stroke, and the opening of the exhaust valve a little before the commencement of the exhaust stroke, and the advance of the spark. The whole problem is itself so complicated, that it is wise to omit as many outside complications as possible. He hopes to deal with these matters in later articles.

Meanwhile, it may be noted, that while on the one hand decrease in weight of the engine, which is of great importance, demands high running speeds, efficiency in working, that is low fuel charges, demand lowered speeds. As in every other case, there will be a critical point, a critical speed with every type of engine, at which efficiency will commence to decrease, though weight per horsepower also decreases. Where the fuel cost question does not matter, and where lightness of the engine does, high speeds will naturally be the rule; but for aeroplane engines, which are the complement of motor car engines, though lightness is of the very highest importance, fuel charge is of still greater importance. The fuel cost of all engines for aeroplanes is very high, and the quantity of gasoline that can be carried on the forms of aeroplane on the market is strictly limited. Hence the range of an aeroplane will depend directly upon the efficiency of its engine. Again, the propeller of the aeroplane will depend directly upon the efficiency of its engine. Again, the propeller of the aeroplane has its highest efficiency when running at a very much lower speed than the high speed engines that are used at present. Hence it would appear that for efficiency in aeroplane work, and for increased radius of flight, lower speed of the engines would appear to be best. Both in motor cars, and in aeroplanes, greater strength is being given to the main fabric of the apparatus. In motor car work, hydraulically pressed steel is now largely being

employed, of a very high tensile strength; so that lightness and strength are obtained together, but the tendency is all in the direction of strength. This means that heavier engines may be carried without bringing unnecessary strains, or stresses upon the chassis. In the case of aeroplanes, the same remark applies.

At the recent Aero Exhibition held in London, one note was very dominant, the increased strength of the fusellages. The fuselage of the aeroplane corresponds to the chassis of the motor car. There is plenty of room for improvement still, but the apparatus already on the market are so much stronger, that it should be possible to allow a greater margin of weight in the engine, and therefore a lower fuel cost, by having a smaller number of revolutions.

It is well understood of course, that power from a reciprocating engine may be obtained in two ways. You may have an engine having a very short stroke, and making a very large number of strokes per minute; or you may have one having a very long stroke, and making

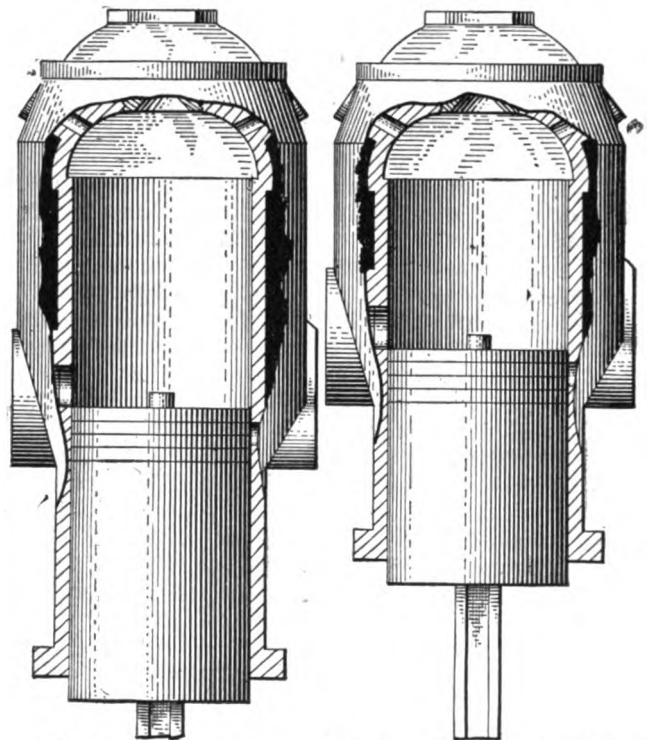


Fig. 5—Diagram of a long stroke engine. Fig. 6—Diagram of a short stroke engine.

Pistons of each cover the same distance in a minute, but one does it in a few strokes, the other in many.

a small number of strokes per minute. Figs. 5 and 6 illustrate this diagrammatically, and you may have any intermediate arrangement. In the case of steam, the range runs from a few strokes per minute in the case of very large engines employed for pumping water at water works, to 500 and 600 revolutions, or 1,000 and 1,200 strokes per minute in the high speed engines that are so largely employed now for driving electric generators. The high speed steam engine costs very much less to construct than the low speed engine; but it requires a great deal more auxiliary appliances to keep it going. The writer ventures to think that the future will see lower speeds and larger engines for motor car and aeroplane work. Another remark may be made in conclusion. In all chemical actions, the slower the action, the more complete it is. You cannot force any chemical, electro chemical, or thermo chemical action, beyond a certain rate economically. You cannot force it at all beyond a certain rate, and if you do, you lead to waste first, and then to troubles in the matter of running.

EVERYDAY EXPERIENCE.

The Green or Reckless Driver in an Emergency—Starting, Stopping and Skidding.

BY JAMES F. HOBART, M. E.

There is a saying that no fiercer combination can be made than that of a woman and a check book, but the statement should be modified for the reason that such a combination is not in it with a "bubble tender-foot" and a high-powered car. What such a combination won't do is certainly not worth thinking about and what it will do is totally destructive to the peace of mind of the experienced driver who chances to be a passenger.

It is the "green" driver who is to be dreaded by both the spectator and the other automobile drivers. He can never be relied upon to do the proper thing at the right time. For instance: He will play the gas horn without turning more gas into the cylinder and he will declutch and apply the brake with great vigor and leave the spark advanced and the gas turned in a-plenty. Again, he will apply the brake fiercely and forget to declutch or to cut down on gas or retard the spark but he remembers these things after the engine has torn itself up for thirty seconds at the rate of 2,000 or more revolutions per minute!

It's all right as long as there is a clear road ahead and the engine is working well, but let another machine suddenly turn into the road a block ahead and coming toward the raw driver and at the same time let a pedestrian suddenly start to cross right ahead of the machine while a trolley car cuts across 200 feet ahead and a fire engine is seen swinging into the road opposite to the trolley car. What will the driver do then? He is clipping along on the high gear, the spark is well advanced and the lever pretty well out toward the spark.

The experienced driver would probably swing out close to the curb so as to clear everything which was coming in his direction from either ahead or behind and at the same time instinctively cut out most of the gas and retard the spark. It only requires one motion of the right hand to do this, and it is done while the car is being sent over to the curb by the left hand on the steering wheel. The driver is now in position for any further move which may be found necessary. While performing these operations he has involuntarily gauged the speed of each moving object and has determined whether he can clear everything at regular speed or whether he must declutch and slow up or stop. Perhaps it is seen that a higher rate of speed will carry the machine through the tangle better than to slow down or stop. It is this ability to judge instantly and infallibly, that marks the difference between a good driver and a bad one.

But the ability to judge speed and distance correctly and quickly is not all—not by a good deal. The car driver must have a full and thoroughly sympathetic knowledge of the motor which he is using. He must know just how the motor will respond to any lever or valve. He must exactly know how long a time is required for the response to become apparent in the behavior of the car, and he must be able to almost unconsciously make the necessary lever movement to produce the required response from the engine without having to stop and think about it.

That is what the experienced driver will do, but in contrast, watch the novice. Upon the first appearance of trouble, he involuntarily grips the steering wheel and the faster trouble appears the tighter his grasp

upon the wheel. Next, he begins to wobble the car. He is undecided whether to run to the curb or to pull out further and try to dodge through on the left of the approaching vehicle. As a result of this involuntary indecision, he moves the wheel back and forth and the car "wobbles" with a violence and suddenness which is very trying to both the mechanism and the passengers.

Next, the green driver loses his nerve and wants to stop right then and there. He has lost all sense of engine responsiveness and doesn't have the least idea of anything except to stop the car as soon as possible. Accordingly, out goes the clutch with spark and gas where they chance to be. Then in goes the brake, even if the brake is not applied before the clutch is released. The probability is that as soon as the driver realizes the engine is racing with an advanced spark and lots of gasoline, he will throw the gas lever back so far that the gasoline supply will be cut off altogether and the engine will be killed, necessitating cranking it before the car can be moved again, if by sheer luck all the passing vehicles have managed to get past the dead car without running into it.

And what should the green driver do under the circumstances described above you may ask? The answer is: First of all, and all the time, keep cool. Nothing is ever gained by getting into a flurry. "It's all well enough to give this advice," said one young chauffeur, "but it's altogether another thing to remember and do it when teams, trolley cars and steam fire engines are tumbling at you!"

And that is the truth. No man, new at the business of driving a car can grasp all the details and act upon them as occasion and emergency require. It is a matter of time to make a good automobile driver. True, some men require much more time than others to learn and accordingly, some men will require an eternity in which to become proficient, while other men will qualify in two weeks to drive a car under any and all conditions. This being the case, a man has no business in trying to run a machine upon a public crowded highway until he has absorbed the principles of automobile handling and knows instinctively what to do at any instant. He will also know exactly what the engine will do upon the occasion of each and any movement of the controlling levers.

The above being the case, a man has no business driving a car on public crowded streets until he has completed his education to a point which will prevent accident. He should seek the secluded roads, and upon them operate the automobile until he can perform each and every operation as called for by road exigencies, without having to stop and think what to do next.

And even experienced drivers, those who can drive a car properly under any and all circumstances, often have erroneous ideas of the real cause of certain results occasioned by manipulation of the control levers. For instance, a good driver recently remarked to the writer: "That man can never learn to handle the spark properly. He will throw out the clutch with the spark way around where it is very hot and that burns out an engine very quickly."

This gentleman carries a very imperfect knowledge of the action of the ignition spark because the spark is no hotter when it is advanced to the limit than it is when retarded as much as possible. The "fatness" of the spark depends upon the batteries or magneto, the coils and the connections, including the spark plugs. It makes no difference whether the spark is ahead or

behind as far as fatness or its being "hot" or "cold" is concerned.

The misunderstanding probably arose by thinking that as advancing the spark caused explosions earlier in the strokes of the engine, that the spark must necessarily be hotter so as to ignite the explosive charge more quickly. Hence the statement about "plugging a hot spark into the engine" thereby "burning out" the cylinder very quickly. As stated, the spark carries exactly the same temperature when it is retarded as when advanced to the limit. The reason why advancing the spark causes the engine to run faster and develop more power is as follows:

When starting an engine—particularly when cranking it—the spark must be so adjusted that it does not enter the cylinder until the crank has passed over the center and the piston is making its power stroke. As the engine accelerates its speed, it is evident that the explosions will occur later and later during the stroke for the reason that while the time in which explosions must occur is constantly decreasing, the time required to pass a spark through and ignite the explosive mixture remains exactly the same. That is, it requires a certain appreciable time—the fraction of a second—in which to generate the spark and ignite the mixture and if this time be right for an engine running 100 R.P.M., it will be far too slow when an engine is running 500 R.P.M. As the time necessary for generating the spark and igniting the mixture cannot be changed, it is necessary, in order to get the spark around on time, to advance it. That is, to move the timer ahead so that the spark is generated before the engine crank gets to the dead center. Thus the spark is turned loose during the last portion of the compression stroke and it gets its work in at about the time the piston gets to its limit of travel so there is a broiling hot freshly fired charge of compressed energy all ready to push the piston down to business.

That is what advancing the spark really does. It merely gets the exploded charge ready, under varying engine speeds, at the time the crank passes over the center into the power stroke. And that explains why the crank kicks back when the attempt is made to crank the engine with the spark advanced. It cannot help but "kick" for the reason that the advanced spark fires the charge during the compression stroke. Therefore, be mighty sure that the spark is retarded before touching the crank of an automobile engine!

As regards "burning" a cylinder by throwing out the clutch while the spark is advanced and the gas lever is away forward. This is another misconception. The "burning" is not caused by the "hotness" of the spark. It is due to an entirely different matter. When the clutch is loosened with the engine in full power, the speed increases to a point which may be dangerous owing to centrifugal force and to the too rapid movement of reciprocating parts. The engine begins to heat rapidly and a tremendous temperature is worked up in a very few seconds if the gas is not throttled down and the spark moved back to a point which will not permit the engine to maintain a fast speed. It is the too frequent explosions which cause the cylinder to heat—not the "hotness" of the igniting spark. The explosions come with such great frequency that the jacket water is unable to carry away the heat as fast as it is released in the cylinder.

At least 25 per cent. of the total heat put into the cylinder by combustion of the gasoline must be carried away by the jacket water. Another 25 per cent. is to escape by the exhaust, still another 25 per cent. by radiation, conduction and by other means and it

can only be expected that when the gasoline consumption is quadrupled by sudden and fast running of the engine, that there will be a tremendous lot of heat loose in the cylinder. The cylinder will be "burnt" all right, as the auto driver expresses it, but the "burning" will not be caused by the increased fatness of an advanced spark. The actual "burning" is accomplished by an excess of heat in the cylinder which was caused by an over-consumption of gasoline, not by the position of the spark, still such an occurrence is prevented by giving a proper position to the spark and that is probably what caused the chauffeur to think that a "fat" advanced spark was what did the business instead of the rapid explosion of gasoline in the cylinder.

Therefore, fix it in every particle of gray matter under your hat that the spark and throttle **MUST** be brought back before the engine is cut free from all resistance upon it as is the case when the clutch is thrown out of gear. It is in order for some inventor to bring out a device like unto the gas, water and pilot valves used on an instantaneous water heater. There, you cannot turn on the main gas valve until the pilot valve has been opened, and presumably lit, and even then, the gas valve cannot be opened without opening the water valve also. Something of this kind is needed in the automobile control apparatus to engine so that the clutch cannot be opened without closing the throttle and retarding the spark. The matter is an easy one. There are lots of interlocking devices which could be used for the purpose. The nearest railroad switch tower is full of such devices and every railroad block signal has half a dozen or more inside of it which could be adopted by the designer to render gas and spark control nearly or quite automatic in its action to the great comfort of the driver and to the longer life of engine and tires as well!

Another rock which trips up the inexperienced driver is—skidding. And that is enough to trip up almost anybody. It is one of the meanest evils the car driver has to contend with and there is but one consolation in connection with skidding, and that one consoles the public much more than it does the car driver. It is the fact that a car don't often skid unless it is at a high rate of speed or the driver tries to change his course from or to a straight line at a considerable rate of speed. Viewed from this angle, skidding is mighty useful in some cases for it kills many a "speed bug" which otherwise would probably lead to disaster.

But the one great lesson which the beginner should learn—and some of the older drivers seem to have forgotten the lesson if they ever learned it—this lesson is: Hands off the brake while the wheels skid! The application of the brake while wheels are skidding, only makes matters much worse, therefore realize as soon as possible that the brake must not be used while the rear wheels are sliding on the ground.

One more think and I am done for this time at least. Don't use a clutch which engages with a jerk and which sends the car ahead or astern suddenly. A clutch which is properly made and adjusted will not do that and if your clutch works in such a manner, overhaul it at once, find and remedy the trouble. Sometimes a very small amount of vaseline or beeswax rubbed over the engaging surfaces of the clutch will cure the trouble which is caused by the surfaces seizing each other too suddenly when the clutch is brought into action.

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NEW YORK, MAY, 1911.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

WE WANT TO BE ON TIME.

The Automobile Dealer and Repairer is due to be published on the 15th of each month, but lately, owing to constantly increasing editions, publication has been always several days late. Readers should not be apprehensive about not getting the magazine until after the 22d of each month, and possibly some may not get it even as early as this date, although we shall do our best to come out earlier. We hope at an early date to reach the mark set, for indeed, we have as much reason for wishing to come out promptly as our readers have to expect us to do so.

CAR DRIVING AND CHARACTER.

One inconsiderate and ignorant driver will do more to make the automobile hated than the judicious and rational driving of thousands. He will leave a trail of blackness wherever he goes just as a cuttlefish fogs and befouls the water in which it swims. His offences not only anger the general public who do not drive or own cars; they are offensive to all other decent car drivers or car occupants.

In most cases there is nothing to be done about it. Even if the offender is amenable to the law, few care to get mixed up in a legal entanglement. Of course, it is well known that most of the cases of reckless driving—of not allowing one to pass after having received a signal, of giving a passing car little or no room or of driving on in case of accident—either arise from too much whiskey or some one driving the car who does not own it and perhaps is stealing its use, and if this fact were

generally assumed, it might make conduct on the road or street as important as it is in social life.

In other words, the character of the occupants of an automobile is just as easily determined as is the character of those in other associations of life.

A REQUEST TO READERS.

Our readers are asked to send matter for the Editorial Department in a different enclosure or on a different sheet from that which is intended for the Business Department. When matters of this kind are written upon the same sheet they often become filed away and never reach the editor. This of course does not always occur, but we find it has occurred, and possibly some reader may have been neglected for this simple reason.

In this connection it may be stated that the old saying concerning reading everything before it is signed and reading a letter before sending it still holds good. Scarcely a day passes that some one does not send a letter from which some important fact is omitted. It may be the omission of the name of a State or a town or even the signature of the writer. Where information is asked of course it is impossible for us to supply it under these circumstances. If any reader has experienced a neglect in not receiving information asked for it is due to one of the foregoing causes.

AN OCCASIONAL LAPSE.

Will our readers kindly overlook it if in this editorial department we occasionally break away from our subject? Acknowledging that one should "stick to his text," we plead guilty to an occasional lapse of purpose; to an almost unconscious straying outside of the limits of the automobile field. But it is not often nor is it for long.

A man's nationality, his religion, and his politics are nobody's business except his own; his nationality because he cannot help it, his religion because it is largely a matter of environment, and his politics because he almost invariably inherited it. So we have no business to interfere with either. But if we occasionally discuss general matters of public interest to the extent of about one page out of every forty, and do it in this department, we feel our readers are friendly enough and indulgent enough to permit it.

WHEN TROUBLE COMES.

Readers are invited to consult the Trouble Department just as freely and often as they choose. But we must again remind them that the prescription or remedy given them will largely depend upon the clearness and fulness with which they state symptoms. Take, for illustration, the subject of "noise." The simple statement that either this or that about their car is "noisy" does not always mean enough to make a correct diagnosis of its cause or a remedy. There are almost as many kinds of noises as there are of cars. There is tapping, popping, pounding, grinding, rumbling, squeaking, roaring, chattering, buzzing, and so on.

Of course, if our experts were able to see the car that is in trouble, and better yet, to run it, the ear and the eye would help much to solve the difficulty. But this not being the case, we trust those writing for information will be explicit, comprehensive, and careful in stating the symptoms. Then, if the letter of inquiry be read over carefully, before being mailed, to see that nothing has been omitted or mis-stated, it will make the matter of advice fairly easy and successful.

EVILS OF MISUSE.

An esteemed publication has a two-page article under the heading: "Evils Incident to Purchase and Use of Motor Trucks." The subject might have been covered by the single sentence: There are no evils incident to the purchase and use of motor trucks. The evils are all due to their misuse.

The motor truck and the motor delivery car are just beginning to be appreciated, and in five years there will be ten in use where there is but one used at present. Of course, if a two-ton truck be run 15 miles an hour, a speed that would destroy a horse-drawn truck of similar capacity in a single hour, it is liable to soon get out of condition, but with fair usage an automobile truck will outlast any horse.

THE PRICE OUTLOOK.

The cost of producing automobiles is not likely to be much reduced for some time. There may be a slight reduction of the cost of selling, but in this case it will be due to more frequent sales; it will not be due to the curtailment of publicity or to lessened income on the part of those who sell cars.

The salesman who can dispose of 50 cars a year at a profit of 10 per cent. on each, may be doing well enough, but he who can dispose of but 10 cars a year is not getting rich very fast even though he gets a profit of 20 per cent. on each car.

When automobiles come into as general or universal use as their merits and their necessity to business and progress demand, and as they will when the fact becomes fully recognized that for their cost there is more comfort and economy and pleasure in them than in anything else that is bought or sold, then their sales will be so enormous that prices may fall a little, but from causes only as stated.

WHAT DOES YOUR POLICY COVER?

Those who get their cars insured should know what the policy covers in return for the annual payment. To learn if you are well insured, inquire whether you would be held free from loss in case of any events like the following:

Would your policy hold if your car should catch fire from hot bearings, from an electric spark over gasoline vapor, from matches, or from a spark from a cigar?

Would it hold good if your car should be destroyed from some cause due to the storage of gasoline?

Would it hold good if your car should collide and be damaged when you or anyone else chances to be driving it?

Would it hold good provided your car be run into when standing by the roadside?

Would it hold good if you collide with a moving or stationary object by the roadside?

Would it hold good if you are racing at the time of an accident?

Would it hold good if the accident should be so trivial as to cause a loss of only a few dollars?

Would it hold good if the car chances to be injured or destroyed owing to some mechanical misbehavior or fault of construction or material?

Every fire insurance policy issued by any company, whether the regulation stock company or a mutual company, puts a number of duties or obligations on the insured which must be literally performed or the insurance becomes void. It is true the company may excuse or waive performance of these obligations, but they are not given to admitting that they have done it after a fire has occurred.

But every condition of this kind is expressed plainly in the insurance policy, and the man who fails to read it makes a serious mistake. It need hardly be stated that since a man's insurance is good only when he does certain things, it is important to do those things, but first to know what they are.

There is often a provision in policies covering insurance on personal property that in order to keep the damage down as much as possible, the insured, after a fire breaks out, shall protect the property from damage in every way he can. This means separating undamaged property from the damaged and so on, and often under the policy no recovery can be had until these things are done.

Moreover, all policies contain a condition that the insurance shall be void if any additional insurance is placed upon the property without the company's consent. The theory on which the law allows an insurance company to make such conditions is that the more insurance a man carries on his property, the less careful of it he is apt to be.

The foregoing are but a few of the points that car owners should know concerning their insurance policies. The contingencies might be very much increased, and are only such as are called to mind after a superficial consideration of the subject.

The rates for automobile insurance are extremely high. Every car owner owes it to himself to know just what he is paying these high rates for, and wherein such protection may be lacking.

PRICE AND LIFE.

A writer for one of the trade publications who ought to know what he is talking about, says: "To-day there are low-priced cars whose makers frankly disclaim any expectation of their product outlasting the second or third season." Such frankness is indeed admirable, but the old rhyme is applicable: "If so soon that I am done for, wonder what I was begun for." A car that will not last more than two seasons is not worth making or purchasing. It may be low-priced, but it is certainly unwise expenditure.

The larger share of the cost of producing an automobile is due to labor, and not to the quality of the material. Of course good material costs more than poor, but the difference between the cost of good material and of ordinary or poor in a single car is less than may be imagined.

The thing, more than anything else, that makes a car long lived is equilibrium—an equality of relative strength between the various parts. The "deacon's one hoss shay" was probably not a very costly vehicle, but each part was just as strong as any other, so it ran "a hundred years, to a day," and went to pieces all at once and nothing first. It is not an easy matter to secure symmetry in an automobile, but the result has been nearly attained, and this, with good material, will make long life, even though the price be low.

JUST THINK OF THIS.

It costs the country about \$215,000,000 a year to maintain its army and navy, to say nothing about the expenditures by the several States on their national guard or the enormous sums paid for pensions, which will probably bring the entire expense up to about \$400,000,000. Just think of it! Four hundred million dollars a year when there is no war!

And while you are about it, dear reader, just imagine what \$400,000,000 a year would do for good roads.

Not only would this enormous sum be far better distributed for such purpose, but it would return in the saving of the cost of transportation and in the improvement in real estate or farm values, more than twice as much more.

When we come to think of it, war was born in barbarism and nurtured in ignorance and cruelty. Why, we consider murderers the greatest menace to society, and yet men are lauded to the skies for murdering one another on the battlefield. In fifty years from now people will look back and wonder how there ever could have been such a thing as civil war, just as we now look back and wonder that there ever could be such a thing as human slavery.

Four hundred million dollars a year expended upon the highways of this country would make it in prosperity and in the diffusion of moderate welfare, the wonder of the civilized world.

Just at this moment we hear a good deal of talk about old age pensions and insurance against idleness, and they have at last reached that extremity in England. Why, with good roads and universal peace, the aged would need no pensions, while the idle would be so from indolence or choice only, and consequently would deserve no consideration whatever.

HOW THE WORLD MOVES.

To one who has mingled in the world of affairs for a good many years, a noticeable and gratifying present-day tendency is the uplift in business ethics. There has never been a time when the query, "Am I my brother's keeper?" has received so generally an affirmative answer. Obligations and duties have of course been strengthened by legal enactments, but even these are the result of a quickened conscience.

Take, for illustration, the business of periodical publishing, where it was not so many years ago that one could advertise about as he pleased. Many of us are familiar with an advertisement that appeared in country newspapers some 25 years ago wherein it was stated that a "sure way to make \$3000 a year" would be sent on receipt of one dollar, and those who sent the money received a printed slip saying: "Do the same as I do." In later times advertisements of a hardly less unscrupulous character were not infrequent.

To-day, however, advertisers are pretty well aware that they will be held to strict legal accountability both as to the letter and spirit of their advertisements. Nor were publishers themselves in former times invariably scrupulous. A few years ago circulation statements were often of the "reader" rather than of the "subscriber" variety. Instead of a plain statement of the number of subscribers, publishers' circulation reports gave the number of readers, with the assumption that there were three, four or five readers to every subscriber, according to stretch of imagination—or conscience. "We have 60,000 readers," often meant but 15,000 subscribers—four readers to a subscriber. But this well worn moral obliquity has at last been straightened. Possibly this in some cases may be due to the fact that no one is now deceived by it, but we believe it usually results from higher business ideals.

It used to be the case that "ethics and etiquette" were the pride and prerogative—and then not too plainly apparent—of professional men only, doctors, lawyers, and clergymen. But they are now beginning to be manifest in plain everyday business.

The "dog-eat-dog," practice is passing away. It is beginning to be recognized that each individual is

bound up in the whole, and that oftentimes individual interests must be sacrificed for the whole. This insular feeling and the things that used to encompass the individual are widening. Why, the man who was outlawed in England some years ago for writing what was then deemed a heretical or objectionable book, but who uttered the noble sentiment, "The world is my country; to do good is my religion," has recently had a suitable monument reared to his memory in one of the cultured communities near this city of New York.

Judging by disclosures now being made as to murderous and dastardly dynamite plots, and the passive attitude or toleration assumed by some of the leaders of labor, they still have something to learn in not only the matter of ethics but in their attitude towards crime, but this is but a passing feeling. Labor will also find that progress and justice walk only in the path of moral uprightness.

THE EFFICIENCY OBSESSION.

Just at the moment one of the leading topics of some of the magazines, and to a somewhat less extent, in the business world, is the subject of "Efficiency," with a capital E. The development thus far is mostly along the lines of academic discussion, and in essays and lectures. It is claimed that in the great industries a good many false motions are made, all adding to the cost of production, yet we fancy a good many who are obsessed by the Efficiency microbe, would be astounded to go into some of the big automobile factories and find to what extent productive efficiency is carried out.

But be this as it may, certain wise men, among them as apostles, a lawyer and a champion tennis player, have made a scientific study of doing industrial things with the least possible waste of muscle, motion and time. One of these professors of Efficiency has gone so far as to show a workman how in a given time he may load three times as much pig iron on a flat car as he formerly did, and the workman was generously given a raise of about 50 per cent. in wages.

Without going deep into this matter, it may be stated that in the matter of efficiency, the compositor is about five times as efficient as he was 40 years ago, the pressman about ten times as efficient, the shoemaker about eight times, the builder about five times, the machinist about four times, and so on all through the list of industrial workers.

In fact, efficiency has reached such a marvelous development that the great difficulty of producers to-day is to find consumers to absorb that efficiency and keep it employed. Producers everywhere of everything conceivable have hard work enough to get rid of the bulk of their product, and they are simply at a loss to know what to do with their "surplus" except to throw it on the market at a forced sale.

The only channel of activity we can think of at the moment that has not increased in efficiency several hundred per cent. during the past half century is the law, and this seems to be as inefficient and slow and hide-bound in custom and form and verbiage—in "hereby and aforesaid," and "provided always," and "whereas"—as it was two centuries ago.

So we venture to suggest to this lawyer professor of business Efficiency that he make a scientific study of false motions and waste of time and material in legal procedure and accomplishment. Truly there is need of it.

Efficiency in the industries is already about all that can be provided for. Too many factories fail to pay

dividends for the reason they can't make enough in ten months of the year to pay expenses for the two months they lie idle because of inability to dispose of the "surplus product."

As for the tennis apostle of industrial Efficiency, possibly it may be just as well if he stick to his racket.

UP TO THE BUYER.

His Responsibility for Much That is Unsatisfactory in the Automobile Industry.

From C. J. Pembroke, New York:—The average buyer does not realize how much he himself is to blame for much that is unsatisfactory with the automobile industry. While I might have taken up this feature in my previous article "Hints To the Buyer and User," I felt as though that article was, in itself, of sufficient length, also that the subjects that I will now call your attention to are worthy of a separate discussion.

Take the subject of cheap (first cost) cars. There has been a great deal of effort on the part of a certain class of auto manufacturers directed toward the production of the largest bunch of material for the least possible amount of money. This has progressed until to-day we might call it a craze. A good proportion of buyers have been quick to snap up these productions, which we might call one year cars, and which run only a short time before they begin to rattle, look bad, certain parts give out, and require all kinds of adjustments.

When we get what looks like three times as much as we should get for our money, we generally find that such an article is worth no more than we paid for it, and it behooves us to look well and see that such things as the tires, bearings, steering gear, radiator, clutch, brakes, coils, magneto, transmission, axles, universal joints, etc., are not of the cheapest possible quality.

If more buyers would insist on these vital parts being of first-class material and construction instead of looking so much at the design, paint and varnish, we would have cars on the market of almost standard construction any of which would be good.

Another thing that has influenced the auto trade and made it possible for inferior cars to keep in existence, is the false pride of the average user, for it is a fact that after some men have purchased a machine and know that they have been "stung," they will deliberately tell their friends that their car is satisfactory and actually recommend it to them. If each user would keep what we might call an "auto diary," and hand this to his friends when asked what he thought of his car, its tires or any other particular part, it would do more to improve the machines on the market than any other concentrated action that I know of. This diary should consist of a record of the purchase price, date of purchase, and thereafter an entry would be made of every cent of expense of both operation and repair, the exact mileage that each tire gave with the make of tire, making note of every adjustment and giving date that adjustments were made, so that if they came too often it would be noticeable. Also, comments on poorly constructed brakes that after the best of adjustment would not stop the car only after severe and laborious pressure was applied to the pedal; control levers that stick and cause trouble in shifting gears; lamps that will not stay lit; gears that make noise; gear cases that will not hold

grease; nuts and bolts that are so located that it is impossible to properly tighten them with ordinary wrenches; how slow the car can with comfort be driven on the high gear; fuel consumption; if the engine overheats and under what condition this happens; average mileage from a certain battery source, giving name of battery used and form of ignition used. Then as some parts will not give trouble, it will be well to know what the make of such parts are so that you can look for the same make on a car you may be about to purchase. Make note of the kind of radiator, clutch, transmission, magneto, coil, pump, carburetor, how the fan is driven, of what material top is constructed, in fact anything that would enlighten yourself or others as just what to look out for when buying another machine so as to avoid the troubles that the first one had caused. If a copy of this diary was to be sent to the makers of the machine, by a majority of the owners, it would help the maker to improve his machine where found wanting, and if the maker knew that such a diary was to be kept he would not dare to take some of the chances that he now does.

The old saying that there are two sides to every argument, was never more true than in the automobile business, for while some makers are trying to see how much they can give for a little money there is the other class who are trying to see just how much the buyer will part with although, we cannot say that he is trying to give any less than the best that his knowledge will permit.

This second class build the best possible kind of a car they know how, but the price they put on to it is ridiculous, because the cost is not in proportion with the cheaper class of cars. Take for instance the \$6,000 cars. It does not cost more than \$2,000 to build a six cylinder 60 h.p. car, using the very best of everything; that is, imported annular ball bearings in the entire rear axle construction, in the transmission, all of the engine bearings except the crankshaft where babbitt is better, in the steering gear, and the use of ball thrust bearings wherever there is a thrust to be resisted, Timken roller bearings in the front wheels, steering pivots on ball bearings, multiple disc clutch, honeycomb radiator, any make of magneto, together with any form of battery ignition that may be wanted, with any make of carburetor, pressed steel frame and the body trimmed in the best hand buffed leather, curled grey hair and the best of spring cushions, with best of everything else such as 36x5 in. tires, top, wind shield and the five lamps.

Now if the maker was to have 25 per cent. profit, and spend 25 per cent. of the cost in advertising he could sell this car to the agent for something like \$3,500 after adding a liberal overhead charge. Add to this the agent's 20 per cent. profit which is surely enough when he has nothing but to pay the freight and send the maker his portion of the money and this type of car should not cost more than \$4,250. Now as there is a car on the market that comes very near up to the specifications mentioned that is selling for \$3,000 it goes to show that I have been liberal with my figures.

Now if the buying public would content themselves with the moderate priced cars, refusing to buy a car of any kind at a greater price than \$4,000 it would be only a year or so before these fictitious prices would be knifed and cars would come down where they belong. But so long as the makers can make just as much money by selling one with a much smaller investment as could be made by selling four or five cars

at a right and fair price, just so long will they continue to keep the prices up.

It is the writer's opinion that the cheapest that the small five passenger touring car fully equipped with glass front, top, lamps, gas tank and tools, can be sold for if of the best possible construction, is something like \$1,800, while a corresponding quality in a large six cylinder seven passenger touring car should be sold somewhere around \$4,000.

Another evil of the automobile business for which the purchaser is directly responsible is the fact that nearly every maker sees fit to soak the user about three to six times as much for a repair part as the same part originally cost in the completed car; that is, if you will take the trouble to obtain a parts catalogue and price list and figure out the cost of a complete car by purchasing the parts separately, you will find the total cost to be from three to six times what you originally paid for your car, while these parts should total up less than the original price, because there is no selling cost, no advertising expense, no painting or assembling to be done.

Now you say, "Why am I to blame for this condition? How can I prevent the maker from 'handing it out to me' when I want a repair? I need the part and must have it, and he has the making of the price." Well, this is the way to do it: Let every purchaser refuse to buy a car until the maker furnishes a complete parts price list and the same is found not to figure higher than the original cost of the car after deducting 30 per cent. to offset his advertising and selling expenses. Easy, is it not?

One reason for the excessive charge for repairs is to discourage the repairing and remodeling of old cars so that new ones will be purchased, for by the sale of these parts at a right price a great many machines would be overhauled and continue to be used.

So long as the buyers will continue to go about the purchasing of an auto, using no more business judgment than when purchasing a 10 cent cigar, being satisfied with a car fresh from the factory, that with an expert demonstrator, is capable of being operated in a smooth, powerful and pleasant manner, just so long will the maker say to himself: there is no use in "casting pearls before swine."

What is the use of one maker doing his best to serve you honestly both in the construction of his car and in his future treatment of your requirements, when a competitor is handing you out lemons?

We as a rule buy an auto for business or pleasure and I for one do not like to have either marred by daily repairs. But worst of all when I send to the maker for a needed part and he soaks me with a price that I know is just ordinary robbery it makes my blood boil and takes away all the pleasure of the machine for the next three months. By this I do not wish to have the reader think I am tight fisted and miserly for I will spend my money foolishly enough, or for that matter, give it away to some fellow that may be in need, but I would rather give away ten dollars than to lose or get beaten out of ten cents.

If the buyers would use good business judgment it would not be long before we would have the automobile business down to a business basis, when we could in the fall send our machine to the factory and have every worn part renewed, the car refinished and returned to us in the spring just as good as new, and by doing this every year a car would last for ten or twelve years with a yearly expense of not more than \$250. But so long as the buyers go around in flocks with an "Easy Mark" sign on their backs and another in front so long will the present condition continue

Two and Four Cycles.

The principal advantages of the two-cycle motor are, a low first cost of the manufacture and a slight advantage of lessened vibration at low speeds.

There is also a slight advantage in the weight in a two-cycle motor, as well as slightly increased power. The cooling and ignition systems for both motors are similar. Power for power the two-cycle motor requires about 12 per cent. more cooling surface than the four-cycle, while there is twice the number of sparks required for the two-cycle.

The problem of lubrication presents some difficulties in the two-cycle design. They have been solved in a large number of ways more or less satisfactory. This question does not present itself in the four-cycle motor further than to keep the motor reservoir supplied with oil.

From the first cost standpoint alone the two-cycle motor is superior, power for power, to the four-cycle, and if against this is balanced the added fuel expense of the two-cycle, the ledger will very soon show that the four-cycle motor is likely to be best for automobile use.

Beware the Curb.

If a car is driven too close to a high curb the running board and fenders may be damaged and the hubs of the wheels may also be injured. It is not always easy for a driver to judge from his seat the height of the curb as compared with the clearance of his running board and fenders, so it is well to maintain a safe distance. Even if the curb is a low one and there is plenty of clearance for the running board, there will be trouble in getting away if the car is run too close for the possible deflection of the front wheels will be found very limited when an attempt is made to turn away from the sidewalk, and the paint and rubber will not last long when forcibly scraped along a rough stone surface.

Leaky Back Axles.

Many back axles leak slightly round the joints of the differential case, which encloses the gear and the differential. Some cases do not leak but few are quite free from a slight suspicion of oil exuding from one or more of the joints. While this leak remains only slight it does not matter, but if so much as a spot of oil drops from the axle when the car is standing after a run one should follow up the matter and be assured just where the oil is coming from and how much is really being lost, for unless this is done one may ruin a back axle for want of lubrication.

Wonderful Creations.

The tendency toward luxury in the automobile is steadily increasing. Those who spend \$3,000 to \$4,000 for a car and think that sufficient, seldom hear of the wonderful "creations"—they are as much that as a woman's Paris costume—the designers are constantly at work on, but the new field is at hand and is energetically being developed. The families who can put out \$50,000 to \$100,000 for new motor cars each year do not mind a few thousand more on this or that so long as they are getting real results.

Stiff Clutches.

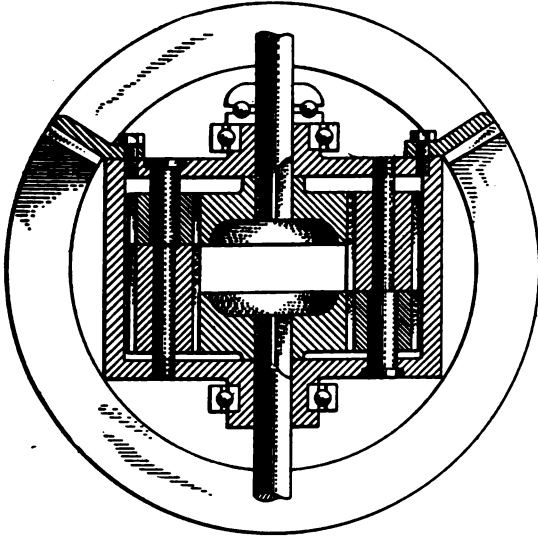
An observing tire salesman declares that stiff clutches are really to blame for the short life of the rear wheel tires on many cars, adding that the practice of novice drivers of letting their clutch in too suddenly is also the cause of much trouble of this sort. When a clutch is let in too quickly the driving wheels spin around before the car has attained any momentum to speak of, with the result that the outer casing is ground off along the tread.

THE DIFFERENTIAL.

Wherein Mr. Pembroke Differs with Betsey Bobbitt, and Why He Favors the Bevel Gear.

From C. J. Pembroke, New York.—I am sorry he did not use his real name as it is not polite to argue with the ladies, and if I really believed it was a lady who wrote that article I would, in respect to her courage, omit any reply, as erroneous as it is.

I was very brief on the subject of differentials because ninety-nine out of one hundred men, even if



Spur Gear Differential.

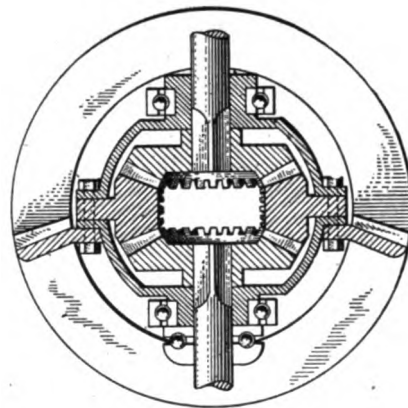
not one were mechanical, would after looking at the two styles, readily see that the bevel gear type is the more mechanical, compact (strength for strength) more symmetrical, and less likely to get out of order. And contrary to his way of thinking, if the same pitch diameters is used with the same amount of metal between the bottom of the teeth and the axis, then the bevel type will be both the easiest and the cheapest to repair. My experience has been that those cars equipped with bevels I have owned or had anything to do with, never needed any attention at all other than lubrication, while I have been compelled to completely replace once and sometimes twice and with one high powered car three times, the spur gear differentials with which they were equipped. Among the fourteen cars I have owned I have had so much trouble with spur gear differentials that I would not even consider a car so equipped.

All of which proves nothing and is like Betsey's statements, simply an expression of personal opinion without a mechanical or other reason being given to really make it clear. So we will try to show from a mechanical standpoint why Betsey is wrong.

Taking up his reasons in their order, I will first try to make clear just why the bevels are better even if both be of equal strength. When one of the gears, its shaft or its bearings, break, or wear out, it is either the result of friction, the thrust load or lack of ability to stand the leverage. If there were no thrust pressure the friction would be reduced to almost nothing except the rubbing of the pitch lines as the teeth turned around, consequently the main thing to be considered is the thrust load, and as this is so closely related to the leverage (that force applied to the driving gear) we can hardly speak of it without first mentioning the leverage, because it is the natural tendency of the driven gear to jump out of mesh with the driver or vice versa, which we call the thrust.

And if it were not for this thrust there would not be any use for the bearings to have caps on them at all, and if this thrust were not great the makers would not use ball thrust bearings to resist it. In the spur type all of this thrust is directly outward and must be resisted by the axle shafts and their bearings, while with the bevel type nearly all of the thrust is simply directed toward the opposite gear, consequently it becomes equalized, and for this reason the pinion gear in the bevel type would float in its natural working position without any axle at all. Thus it is plain that with the spur type there is at all times an excessive strain on the shafts which causes them to wear out quickly. The end thrust, or that force that tries to push the bevel pinion out from between the two drive gears, is not of sufficient amount to take note of, for as you will see by observation, there is no thrust bearing used at this point even in the most expensive cars, and were they needed some of the high grade machines would have them if for nothing more than a talking point.

I am somewhat inclined to believe that Betsey really is a lady, and has never done any actual work in a machine shop, for if she had the actual experience as I have had, and were able to operate any machine in the shop from a gear shaper down to a drill press, and if she owned and operated a machine shop of her own as I do, and then if she noted the amount of time that it took to get two parallel shafts in absolute alignment she would begin to realize that it is almost impossible to get the eight parallel shafts of a spur differential in alignment, and this is another reason why they wear out. If it were not for the jigs that the makers of this type of differential use to locate the bearings it would take so much time to locate them as to make it so expensive as to prohibit their use. With the bevel type any machinist could lay out the four shaft bearings with a center square in ten minutes and



Bevel Gear Differential.

if he did get them a little out of equal spacing, so long as he kept them in the middle of the housing it would not be one particle of disadvantage. This load on the bevel type is so equally distributed that we could operate it perfectly without any housing at all, and without either housing or thrust bearing it could be operated, while this would be impossible with the spur type. In fact, when it comes to the location of and the labor involved of locating them, right here is where the bevel gear has it over the spur gear just like a tent over a circus.

Friend Bobbett's third reason, referring to the shape of the housing shows a still greater lack of knowledge, because if he will ship to me a spur gear housing I will remove the spur gears and put a set of bevel gears

in their place. All I will ask is that he deposit with the editor of this journal a sufficient amount to cover the actual work provided I accomplish the feat. If I fail, I will donate \$100 to any institution that he may name. I will also agree to put a larger and more powerful gear in the same housing. But it is impossible to put a spur gear differential of the same capacity in the spherical and small housing of the bevel type. The only reason that the maker of the bevel type does not use the clumsy, ill-shaped, heavy housing of the spur gear is that he can and does improve on it.

Bobbett did not say anything about the wear of the teeth or the strains that are put upon them, but while we are at it let us show up another very serious defect of the spur gear. The bevels always wear evenly all around—they cannot do otherwise—while the spur gears, due to one lapping just half way on the other, and due to one of the halves engaging the main drive gear, and the other half being engaged with another of the pinions of the same size as itself, there is an uneven strain applied which causes an uneven wear. This is plainly visible on every one of the pinions when you come to knock down a car that has been used for only a short time.

If the same quality of material be used in both forms of construction, the spur gear, instead of being the cheaper, as stated, will cost more. With gears of the same pitch, same amount of metal between the bottom of the teeth and the axis, and the same width of face, then the spur gear type has two large drive gears, eight small pinions, eight shafts, sixteen bearings, fully twice as large a case, while with the bevel type there is only the two large drive gears, four small pinions, with a single one-piece spider for the four shafts and four bearings. Then as the pinions of the spur gears are carried on shafts in the form of large screws, it is necessary to tap out eight holes, making it necessary to do 24 operations to locate the shafts in the spur type as against four for the bevel type, and as it is labor that costs in a machine shop, not material, it looks to me as if the spur cost the most if it is as large and as good, but it is made small and as spur gears can be cut on other than gear shapers it sometimes saves the cost of extra machines. Then there are a lot of fellows in the automobile business that, like Betsey, don't stop to figure out the cost, the principle involved or in fact anything else, simply making that which first comes into their heads, regardless of cost or worth.

I enclose a sketch that shows both a spur gear and a bevel gear differential and as I have been very careful to keep the size and strength of gears in as near exact proportion as possible, it shows just how much more clumsy, power for power, the spur type really is. The outer circle shows the respective size of the axle housing as would be seen from the outside, while the inner circle shows the respective proportions of the differential itself and that the spur gear type has just twice the bulk.

It looks as if these two gears were designed, one for a sixty h.p. motor and the other for about a fifteen h.p., but they are both designed of exactly the same strength and one would simply take the place of the other. Thus you see that when Betsey hands us out any arguments, along the line of the spur gear now being made as strong and at the same time more compact, than the bevel type, it is up to him to submit to us two drawings that will show how this is accomplished, for this is a case where drawings speak louder than words and at the time tell the truth.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

The fine weather and children using the streets and highways for playgrounds results in an unusually large number of accidents this month. It would be impossible to give even the bare facts of a tithe of the deaths that have occurred to children by being run over while playing in the street. An unusually exasperating feature of these deplorable accidents is the feeling among parents that children have a right to use the public streets and highways for playing. Below will be found examples of a few accidents that are impressive:

No Bridge There.—Believing that a bridge spanned a creek near Oakland, Cal., the secretary of the Oakland Motor Club drove his machine over the bank to his death. The heavy car, going at a rapid rate, turned completely over as it fell. He was pinned by the steering wheel and could not escape. His companion escaped by jumping from the car.

Two Lads Crushed to Death.—Near Toledo, Ohio, two lads who had been stealing rides on the rear of wagons jumped off in the path of onrushing automobiles, each occupied by five persons, and were crushed to death, one in plain view of his parents. Evidence points to little if any blame on the part of the drivers of the automobiles. Yet fond parents will still merely mildly protest instead of taking their sons across their knees whenever they learn of their stealing rides on the rear of wagons.

Result of a Tire Explosion.—In Louisville, Ky., a chauffeur was making repairs on a car and another man was standing by watching. (Have you ever noticed how quickly the repair of a car will draw a curious crowd?) Well, a tire exploded in some way with force enough to dislodge the rim, which was hurled with terrific force and struck both the men. The chauffeur was struck on the head and knocked a distance of ten feet. The man looking on was struck behind the ear and was rendered unconscious. His injuries are of a most serious nature. The blow behind the ear caused him to suffer concussion of the brain.

All in a Day.—When the returns from an east side, New York, joy ride were all in, recently, one man was dying in Bellevue Hospital, two were under arrest on a charge of stealing three autos in one night, two others locked up as suspicious persons, a fine automobile had been wrecked and burned, a large crowd had seen a blaze of gasoline extending a block in Third avenue, men from one fire station were kept on the jump for a short time and the police reserves had been called out.

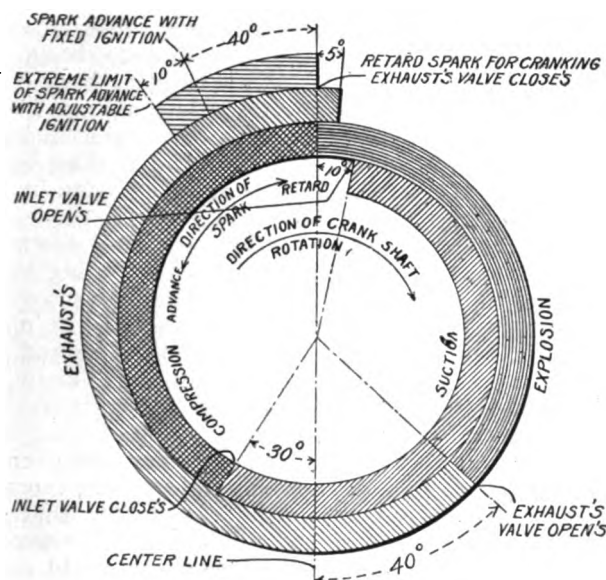
One Killed and Another Dying.—As a climax to a joy ride before daybreak near Newburg, N. Y., one woman is dead, another dying and their two men associates are badly injured. One of the men is under arrest charged with manslaughter and the other has disappeared. The driver was not familiar with the road and knew little about running a car, as it was the first time he had ever driven a car alone. Near a lake there are two sharp turns in the highway. While driving at a rate of twenty-five miles an hour around one of these curves the car plunged from the roadway into the ditch and sideswiped a stone wall with the result as stated.

Brakes Thrown on too Quickly.—At Denver, Col.,

two men narrowly escaped death when their car turned turtle and pinioned the occupants underneath. The machine was traveling at a fair rate of speed. The driver, when the wheels began to skid, in his effort to stop the machine threw on the brakes too quickly. The vehicle lurched forward and turned completely over. Passersby pulled the men from beneath the pile of wreckage.

For Timing the Motor.

From James F. Tracy, Pennsylvania.—I enclose a sketch explaining the timing of a gasoline motor which was adopted by me. As you will note, it gives



all the details and information necessary, and it may possibly be of interest to some of your readers.

Worm Gear Advantages.

The silence of worm gear is indisputable, its efficiency demonstrable. It demands less intricate mounting, involves no hardening risks, provides an exceedingly wide range of gear ratio without change of parts, has an exceptionally long life, is independent of subsequent adjustment and is as cheap to construct as the present bevel gear. Its efficiency under ideal conditions is at least equal to the most accurately cut and delicately adjusted bevel gearing, while its commercial efficiency is higher. There is a total lack of the short period vibration invariably set up with bevel gear, with the result that not only is the final drive silent, but the sound, of the transmission devices between the final drive and the engine are themselves mitigated.

How To Get Good Roads.

The articles appearing from time to time in this publication on the King Drag have been published in pamphlet form. We can furnish these pamphlets at \$1.00 a hundred, postage prepaid in a single package to any address. Some of our readers may wish to purchase these pamphlets and have them distributed where they will do good.

With the King Drag good roads can be constructed at a much lower cost than by any other method ever devised. Car owners are very much interested in good roads and the wide distribution of this little pamphlet would be of material assistance. It not only tells how the King Drag is constructed, but how to use it. Address all correspondence to the Motor Vehicle Publishing Company, 24 Murray street, New York City.

JUST A FOOT CUSHION.

But It Caused a Lot of Trouble and the Good Wife was the Innocent Cause.

From L. H. Boor, West Virginia.—As I lie here in bed with not much wrong, but a boil in a place where it makes it much more pleasant in bed than out, I have been reviewing your journals for several issues back and I see so many little articles from different writers that strike me as being so funny as to their experiences with automobiles, that I can't refrain from giving a little of mine.

Last June I purchased my first car, a Mitchell model R, and like a little boy with his first pair of red topped boots, I thought it was the best car that ever was made. Well, the latter part of July we decided to take a trip to the southern central part of Iowa, which was quite an undertaking for me, as at that time I hardly knew just what made the wheels go round. As my wife is a jolly good woman who can make fun out of real trouble I felt sure we could make it all right, so we started. Any one who ever traveled in West Virginia can easily see why we never fracture any speed laws, for 10 to 15 miles per hour is mighty good going here. Well, we landed in Columbus, O., the first day, and while we had nothing to drink that day but good clear water, we were both mighty drunk when we got out of the car that evening. We got a good night's rest and felt good the next morning. We started for Indianapolis, Ind., via the national pike which is certainly a fine road. When we got out of Columbus, we began to realize from the way everybody was going around us that we would have to get out of that old way of West Virginia driving, so I began to hook her up little by little. Soon we were going at such a terrific rate that I felt sure that Barney Oldsfield's best record would have been shattered by several seconds, but on looking down at the speedometer, saw it was playing between the 20 and 25 mile mark and still the other autos continued to go around us seemingly about four times as fast as we were going, so I decided that I was no speed king, and settled down to a fair gait and let everybody go around us, taking their dust and smoke good-naturedly for they were soon out of sight, but with all their fast driving we went in ahead of some cars that passed us between Columbus and Richmond, Ind. We made the trip through to Osceola, Iowa, in five days, a distance of 906 miles by the speedometer. Believe me or not, the entire trip was made without touching a thing about the machine, and we had but two punctures, and the car seemed to be running much better when we landed there than when we started. All I did was to see that it had plenty of oil and gasoline, and I treated it as though it was one of the best horses I had ever driven. I never crowded it up hill nor tried to make up any lost time going down hill. About every 50 or 75 miles we stopped under some good shade tree and looked it all over to see that nothing was getting loose and that everything had plenty of oil, etc. When we started on I felt that the little bit of rest had done it a lot of good and it always seemed to start off with renewed energy.

We certainly enjoyed our car while we were at home, as all my folks live there. One day we had my brother, his wife and two little ones out for a day's drive, and that night going home, our first trouble came. We were about 15 miles from home and noticed my engine losing power, so we began to look for the trouble. We found the transmission gear case pretty warm so I thought perhaps the oil had got low, and

poured in some. By that time it had cooled down enough so it seemed to start off all O. K. but it only went about two miles when it began to drag again. So I began to look for a place to camp, and seeing a good place at the side of the road, I ran the front wheels upon it, making a pretty good pit to work under the car. We decided to retire for the night, so we spread our blankets and robes and lay down, the weather being very warm and dry. As soon as daylight began to peep, my brother and I found the little lock washer at the rear end of the gear case in the Mitchell 1910 car had worked tight and shut the oil out causing it to heat. We soon made the adjustment, and were on our way rejoicing. The Mitchell Co. have since discovered this little lock washer is not adequate for the purpose intended and have improved on it.

When we started back there had been considerable rain and the dirt roads were in poor shape for travel. We had dirt roads till we got to Danville, Ill., and lay over there three days. As the sun was not shining much, and still raining a little, we then decided to "mud it" through, which we did on second speed about 7 miles per hour. When we struck good roads we took our tire chains off and began hitting that dizzy pace again, 16 to 20 miles per hour. Shortly before we got to Indianapolis, my car began to go lame, and as that was my first experience with ignition trouble was at a loss to know just what to do. I tried everything that I knew of and could not find it, and as we were only a short distance from Indianapolis, decided to have some one look it over when we got there. I paid a man 25 cents for telling me I had too much oil in the crank-case and that it would be all right soon as some of it was used up. The trouble seemed to be in just one cylinder and the spark plug would sputter up, which he said was caused from the oil. So we started on, thinking it would right itself shortly. By cleaning the plug about every 25 miles it ran pretty good, but when we got to Columbus, it was still no better. Then I began to get sick, and to shout for help from every person I saw regardless of their occupation. Of course everyone told his remedy—several of which I had tried myself. Some that were wanting a job said the engine would have to be taken down and cleaned, and as I knew that would take some little time, and I could hardly see how one cylinder would get so dirty and the other three in perfect condition, I decided not to have anything done, thinking if it went entirely to the bad, I could pull any hill in eastern Ohio or West Virginia on three legs on low speed. So we started on. But as it was still hopping along like a boy with a sore toe, I began to get that tired feeling again, and I finally found a wire that was a little loose on the magneto. Tracing this wire I found it led to the lame cylinder. At that instant my sick feeling left me, and I tightened up the wire, cleaned the spark plug once more, and jumped in the car, the happiest man you ever saw, for I was sure that was the end of our troubles. It was. So we landed home all O. K., about 60 miles east of Wheeling, where the aviators have a decided advantage over us for about nine months in the year on account of bad roads.

I must tell you of one more little trip we had soon after we returned. We started to Fairmont, our county seat, a distance of about 15 miles. The engine began to slow down before we hardly got started. I thought nothing of that, as it was pretty cold, and would be all right soon as it warmed up a little. But it did not seem to be getting any better, so my wife proposed going back, but by that time I had begun to

expel some of my temper slowly, and said we would go to Fairmont, if it took all the afternoon, and if we never got back. So on we went and came to a small stream we had to ford. It went within a few feet of the water and stopped, which was very kind in not going on into the water. I started it up, and before I got in it stopped again. I gave her another jerk, got in and sat there, quite a while, pondering whether to take my wife's advice or go on. After sitting there some little time, I decided to try it, giving her quite a lot of steam so I let in the clutch and into the water we went. Just as the front wheels reached dry land on the other side, she stopped again. I was pretty well pleased to think it had gone through the water without stopping, and we finally got there. While my wife did her shopping, I decided to have the trouble looked into and be ready to start back soon as she was through. About that time an old friend of mine came along and offered his services, so he looked over everything very carefully, and finding nothing, decided it must have been a little water in the gasoline. After running around town a little we started for home. We had hardly got out of town till it began slowing down again, and after worrying along for a while I began to get cold feet knowing we had some pretty bad roads to go over especially at night and with a balky engine. I proposed turning and going back, as it was most all down hill and I knew we could coast if she did not want to go any other way. When we again reached the city, my friend was very much surprised, so we held a short council and decided to get a corps of trouble men and hold a post mortem the next morning, which we did. And how that car was chopped up was a fright. Finding nothing wrong, we decided to take her out and see if we could catch her in one of her brain storms. My! But how the city ordinances did suffer for about two hours. We put her around over the streets from low speed with the cut out open to 45 miles per hour. Just about the time the cops decided we had run wild long enough and were going to pull us in, we brought her to a standstill. Everything was in fine shape and she had never missed a heart beat. After my friend had expressed himself that it was the best car he ever had driven, we decided to try for home again. After bidding our friends good by, we started, and before we got off the street, it stopped again, but as it was down hill I let her coast till we struck the bottom. Letting in the clutch, it started off all right, but it soon stopped, and we just sat there and looked at each other for some little time. Finally my wife said: "Could it be anything in this cushion that I have under my feet?" I looked down and saw it was the hoodoo. This cushion had flowers all over it made of a tinsel braid, and as it was easier to keep on her feet by having it shoved up snug under the spark box, she usually kept it right there. The coil box is a Splitdorf, with three posts exposed on the bottom to connect the wires, so any one can see how easy it would be to make a short circuit with the cushion.

So that was the end of our troubles. Now if any reader of the journal ever had anything like it, I would like to hear from him.

Keep the Muffler Clean.

One method of avoiding noise and the explosion of unfired charges is to keep the muffler clean. This will also obviate back pressure. The surface of the muffler assists to cool the exhaust to an appreciable extent, and the cooler the waste gases enter the air the less the noise.

THE CAR AND THE LAW.

Necessary Noise.—The right to operate an automobile carries with it the right to make the noises incidental to its operation. It is a recognized rule of law, that an operator of an automobile must take notice of the road, and that where he knows, or by the exercise of reasonable prudence ought to know, that his machine has frightened a horse, it is his duty to stop the machine, which is presumed to be always under control, and it is a further duty recognized by the statute that, if he is requested by signal or otherwise to stop, he shall not go further unless necessary to avoid injury, or unless the horse appeared to be under control. In an action for personal injuries to the plaintiff by the frightening of the horse by the defendant's automobile, the complaint alleged several items of negligence, including the excessive speed of the machine, its loud noise, and its failure to stop on signal when it was apparent that the horse was frightened. Held that the fact that the evidence was not sufficient to make out some of the charges of negligence was no fatal to a recovery, if it sustained any one charge of the defendant's negligence." *Brown vs. Thorne*, III Pac. (Wash.), 1047.

Employer's Liability for Chauffeur.—The following case recently decided by the Supreme Court of Massachusetts, so clearly lays down the rule as to liability for acts of a chauffeur, when the chauffeur is exceeding his authority, as to deserve careful reading: "The plaintiff while exercising due care and traveling on Dartmouth Street opposite the public library in Boston, was injured by the negligence of one Freeman, who was driving the defendant's motor car. Freeman was not in the general employ of the defendant, but on the day in question had been asked by him to drive the car from the Stevens garage in the town of Brookline to the shop of one Burlingame, also in Brookline and less than a mile away, for some repair. Later in the day Freeman took the car, drove first to Coolidge Corner, a square in Brookline, not on the way to Burlingame shop, where he had lunch. Then with a friend he drove the car about six miles further out of the way from the garage to the Burlingame shop to a shop in Boston for the purpose of getting a chain for his own uses. He had started to return to Brookline and was bound for the Burlingame shop when the accident happened. The defendant gave no directions to go to Coolidge Corner or to Boston, and this ride was taken without his knowledge. Freeman had worked at the Stevens garage where the defendant kept his motor car, and once before had driven it to Boston, but under what circumstances does not appear.

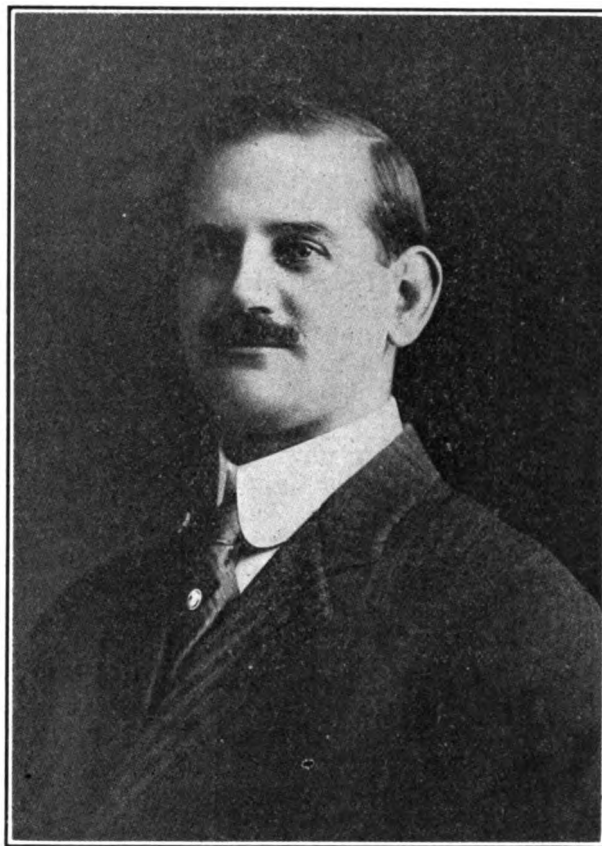
"The principles which govern the rights of the parties are settled. The master is liable for the act of a servant in charge of his vehicle when the latter is acting in the main with the master's express or implied authority upon his business and in the course of the employment for the purpose of doing the work for which he is engaged. The master is not liable if the servant has abandoned his obligations, and is doing something not in compliance with the express or implied authority given, and is not acting in pursuance of the general purpose of his occupation or in connection with the doing of the master's work.

May Exclude from Certain Highways.—The exercise of the State's police power to limit and control the use of highways, as by excluding automobiles from some of them, is not a violation of the fourteenth amendment to the United States Constitution, forbidding any State to deny to any person the equal

protection of the laws. The legislature by prohibiting the use of automobiles in such of the four towns on the island of Mt. Desert as should accept the act, having determined that it was reasonable and expedient, its judgment must be deemed exclusive, and the courts cannot say that the act had no tendency to promote the safety, health, and welfare of the people; and hence that it was not enacted in the exercise of the State's police power." *State vs. Phillips*, 78 Atl. (Me.), 283.

New Sales Manager of The U. S. Motor Company.

Alfred Reeves tendered his resignation as general manager of the Association of Licensed Automobile Manufacturers, and has become general sales man-



ALFRED REEVES.

ager of the United States Motor Company, which markets Maxwell, Stoddard-Dayton, Columbia, Brush and Sampson cars, with headquarters in New York.

The acquisition of Mr. Reeves is in line with the policy of President Benjamin Briscoe of the U. S. Motor Company, to strengthen all the departments of the big corporation which has obtained such a large share of the motor car business. Additions to the engineering, to the manufacturing and to other departments are being made, with a view of supplying to the public the best in design and construction in motor cars and trucks, at proper prices.

Besides the cars named above, the United States Motor Company controls the Providence Engineering Works, Gray Motor Company, Briscoe Mfg. Company, and the Westchester Appliance Company. Its factories are located at Tarrytown, N. Y.; New Castle, Ind.; Providence, R. I.; Hartford, Conn.; Detroit, Mich.; Newark, N. J. and Dayton, Ohio.

Mr. Reeves has been identified with the automobile trade since its inception.



This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Inquirers will please write plainly and give full particulars of their trouble, stated as clearly as possible.

536 Third Cylinder Difficulty.

From John Wilson, Massachusetts.—I have a four-cylinder 1909 Pope-Hartford car and it don't seem to fire on the third cylinder unless I go about 30 miles or up grade when I can open her up. When I remove the spark plug it is covered with oil or gasoline and I find it the same on top of the piston. New wire improves it very little. Valves are ground tight and the compression almost as good as the other three cylinders. Have a fine spark when putting third wire against the third cylinder and the spark plug. Also shows a good spark. It acts the same on any spark plugs.

Reply.—There are so many causes for the trouble you are having that we might fill this page with suggestions and yet not hit the one peculiar to your case, and as you are so near a Pope-Hartford branch we would suggest your seeing them and have the car looked over. In some of these questions we are much in the position of a doctor trying to prescribe for a patient by telephone. He may hit it right but if he saw the patient he would know at once what to do.

537 Oil in the Cylinder.

From August Walta, New York.—I have a Maxwell runabout, 12 h.p. Has been run about 1,115 miles as near as I can get at it and has always been taken care of. It was all right last fall when I packed it up for the winter. A few weeks ago I let a party, who is supposed to be a competent man, scrape the cylinders and grind the valves and clean out all the old oil and replace with new oil. I thought he did a good job. It is an opposed two-cylinder car. I haven't run it since but I started the engine up the other day and it smoked so badly that I had to stop it and the oil came out the spark plug—the one to the right—so that the cylinder did not work much. Since then I let the oil out the crank-case and there wasn't a glass of oil in it and I often put even more than that in.

Can you give me the reason as to how the oil gets in that cylinder? The engine was apart and everything seemed to be in good shape, the rings were all right and were placed all right. I run on batteries and they are very weak and use the same spark plug I used last summer. If you will write me it will be a big favor.

This car stands on the level. Is there any reason for the oil getting in that cylinder more than common? It never bothered me before and I use the same oil as last summer. It was so bad that it burned the packing from the exhaust pipe next to the cylinder. Some of the oil dropped on the floor after it came through the muffler. If you can give me information in regard to this I will be more than pleased to get it. The man who did the work has worked on many Maxwell cars. He says it is weak batteries but I can't see into that.

Reply.—No doubt the man who did the work on your motor put in more oil than was required for ordinary running, as is often done after having a motor apart as a protection against any possibility of cutting a newly fitted bearing. The short run naturally smoked badly

and lowered the oil to the amount you mention. Put back the proper amount of oil and you will undoubtedly find the motor working well with a good set of batteries. The piston rings may not be as tight in the cylinder mentioned as they are in the other, thus allowing more oil to get past it.

538 Handling the Car on Hills.

From E. L., Boston.—An article in a recent number mentioned that the proper way to brake a car was by the engine—in low gear—the brakes being for emergency only.

Will you give more explicitly the proper way to handle a car as to economy and otherwise down hills, long and short ones, those steep and those of a slight grade, all particulars as to releasing clutch, being in high, second, low and neutral, throttle closed and open, switch on and off and if the motor is not running when nearing the foot of hills, please give directions for starting the engine. The writer refers to 1910 four-cylinder car, leather-faced cone clutch, sliding gear, selective, three speeds forward.

Reply.—Opinions differ as to the proper way to handle a car on hills. So all I can give is the method I have used for the past ten years and found satisfactory. When starting down a sharp incline, either long or short, put the gears in the speed which experience teaches you is the one best adapted to the particular incline. Retard the spark and throttle fully and turn off the switch, using the brakes only to keep the car under perfect control. When nearing the bottom of the hill all you have to do to start the motor again is to ~~advance the throttle as in cranking the car and~~ turn the switch, the motor being in motion it will at once begin to explode and take up its regular work.

If the clutch has been disengaged and the motor is not running near the foot of the hill, place the control levers in the starting position, put on the switch, place the gears in high speed and let in the clutch easily. As the clutch begins to engage the motor will be turned the same as if done by cranking.

Many times long trips may be made without the use of any brakes after an operator becomes familiar with the braking power of his motor, which not only means a saving in wear on the brakes and leaves them in good condition for emergencies but is beneficial to the motor as it allows it many rests and a chance to cool off.

539 Loose Battery Connection.

From G. C. Weeks, North Carolina.—A few days ago, the writer was out, teaching a beginner to drive a 40 h.p. touring car. The beginner had been driving two hours or more, when we stopped for a few minutes. When we attempted to start the motor, it refused to go. After worrying with it for a while, we decided that batteries were weak or exhausted, and having the dual igniting system we put switch on magneto, and then "spun" the motor, which started all right. We again stopped the motor, and tried to start on batteries again but could not, but started it again on the magneto, and started it O. K. This convinced us that batteries were exhausted, but when we got home, tested the batteries with an ammeter, and found them all right. After the machine had been standing a while it could be started on the batteries.

At the time the motor would not start, it was quite hot, as is generally the result of a beginner driving. Was it because it was hot, that it would not start on batteries? If so, why did it start on the magneto?

Reply.—If your batteries tested all right with an ammeter, the place to look for trouble is in all battery connections as you, no doubt, have a loose one somewhere.

At times it comes in good contact and you will be able to start; then it will shake loose again and cause trouble the next time. The motor being hot should make it start easier.

540 **Brake Trouble.**

From H. R. Sugg, Iowa.—It is the exception that I ever see anything in the Trouble Department from Maxwell owners. Why this is I cannot say, for they surely have their share of troubles. Maybe you can help me out a little. I have a 1910 model Q Maxwell with which I have a lot of trouble with the brake grinding and rattling. The inside brake clatters and grinds against the inside of the drum. The grinding is worse when the car is run fast. The manufacturers assure me that any machinist ought to be able to remedy it but they cannot and up to this time the manufacturers have not suggested anything to do for it.

Another difficulty is the dripping of the oil from the mechanical feed when the car is standing. Dripping as much as an inch and a half out of the oil container. The floor is covered with oil every morning under the car. Then too I am troubled on account of the oil coming up in large amount around the guide through which the push rods work. The guides are too large for the rods. This is only the case on the two front push rods on each side. The fan forces this oil through the opening in the hood keeping the outside of the hood and the front of the fenders covered with oil.

Reply.—The grinding in your brake drums is caused by the connecting pins being worn, allowing the band to drag on the lower side of the drums. Put in new pins or attach a small spring to the lower side of the brake band to hold it up in place. The dripping oil from the mechanical feed would indicate a leak in the outside casing which any mechanic should be able to repair. The push rods or guides are no doubt worn, which would necessitate their being replaced with new.

541 **Will not Start on the Magneto.**

From E. E. Wolf, Iowa.—Will you answer me through your paper the following:

A Ford automobile of 1909 will not at times start on the magneto. The wiring is good, coil is good and the plugs are all right. Will start for days good on the magneto and then all at once refuse to start. Can switch on the batteries and it will start at once and throw the switch to the magneto at once and it runs all right, and probably will start for twenty times on the magneto, and then all at once will refuse to start and will have to start on the batteries again. The magneto is built in the fly wheels of the engine as all Fords are made now, and if it starts at once why not always? Carburetor is all right. Can an electric headlight using 8 volts be run successfully on dry batteries testing 20 amperes and 16-10 volts? I would only want to use the lights 20 or 30 minutes at a time. About how many hours lighting would a set of batteries give, by using such a short time at once and would the light have to be changed any from what it is made to run on a storage battery?

Reply.—A poor contact on the magneto circuit is usually the cause of this trouble. Look over all contacts and see that they are clean and all the joints tight. However, if you have no more trouble than you mention it would be hardly advisable to spend much time or money on it.

A 16 candle power 8 volt head lamp could be run about 3½ hours with the battery you mention. Use the same lamp as for storage battery.

542 **Power of an Engine.**

From G. D., Illinois.—Would you please answer in

your next issue what is the horsepower of a two-cylinder engine of 4¾-inch bore and 6¼-inch stroke? Also would you describe the ignition of a gasoline motor or where I could get information on the subject?

Reply.—The A. L. A. M. rating of your motor would be 15 5-16 horsepower. In our April issue, page 65, is given a very good horsepower formula.

The July, 1910, issue contains an exhaustive article on ignition, which will, no doubt, cover your wants.

543 **Motor Dies Down.**

From E. Nelson, South Dakota.—After leaving the motor run slowly for about five or ten minutes (car standing), then feeding more gasoline to pick up, the motor dies down. Can you tell me the reason why, and the remedy?

Reply.—Your trouble is caused by the gasoline level being too high in the carburetor, which allows a quantity of gasoline to collect in the air chamber when running at low speed. Then if the throttle is opened quickly, this gasoline is drawn into the cylinders, giving so rich a mixture that it will not ignite readily. To remedy, remove the carburetor and lower the float level about one-sixteenth inch.

544 **Mixture Fires Back.**

From William Beard, Colorado.—I would like to ask through your columns how it is that too thin a mixture will fire back through the carburetor when ignition does not take place until the intake valve is closed.

Reply.—The thin mixture is much more explosive than a heavy mixture and so is ignited by coming in contact with the heated walls of the cylinder and the hot gases still remaining in the cylinder.

545 **Battery Trouble.**

From Edward Lundgren, Minnesota.—I have had battery trouble with my car for a whole year. Just as soon as I put in a new set of batteries, it don't take more than a week before they are emptied. So what troubles me is that I don't know where the electricity goes because I have a magneto, and when I am through running my car for the day I always disconnect my batteries. My car was overhauled last year and my wiring looked over, but it seems to be the same this year as it was the year before.

Reply.—If you carry the batteries in a metal box see that the sides and bottom are covered with rubber or wood to prevent the batteries from coming in contact with the metal at any point, as if they do you are liable to have a short circuit caused by the paper covers absorbing moisture and so allowing the current to flow from one to another. If the batteries are safe from this source of leakage, remove one of the wires and test with an ammeter to determine if any current flows when the switch is off. If the meter is found to register any flow, it is conclusive proof that the insulation is bad somewhere on the wiring and should be repaired, or better, a new piece of wire put in.

546 **Cylinder Fires Unevenly.**

George Shutt, New York.—I am running a 1910 four-cylinder Reo car. The head cylinder in the rear block does not fire even. The cylinder will run even for a short time and then it will fire every other charge that it takes in, and then run for a short time like that. Then it will stop. When I take out the spark plug it is all oil. By changing the spark plug it will run a short time and then the same occurs as related above. The cylinder when connected alone will

run the engine and not skip, but when all are connected up it will not work right. The compression is good. I have taken out the connecting rod and filed off the cup on the under side and it does not slack the flow of oil in the cylinder. The other cylinders run good. The carburetor is a Stromberg and it is adjusted the best that I can adjust it. When running on the road it will explode gas in the muffler, and there is a back action in the carburetor.

Reply.—Your trouble is no doubt due to bad piston rings in this cylinder which allow the oil to collect in the explosion chamber and foul the plug. This would also account for the explosion in the muffler as an unexploded charge from this cylinder would be emptied into the exhaust and there exploded by the mixture, not exhaust, coming in contact with it.

547 Oil Grooves on the Pistons.

From E. H. Metcalf, New Hampshire.—Your reply 518 to J. C. Sonner contains a reference to an oil groove on the pistons of the 1911 Buick. I have a car of the same bore as the Buick and with the same type of circulated splash lubricating system. It uses a good deal too much oil, giving a smoky exhaust most of the time. I had been thinking of making changes in the crank-case so that the oil would start to overflow at a lower level, but if some form of groove on the pistons would keep the oil from working up into the explosion chamber it will answer better. What is your opinion? And what is the location and size of the oil groove in the Buick? My car is a K-R-I-T- 1910.

Reply.—These oil grooves are an extension of the lower oil ring. Remove the pistons and widen the lower ring slot one-eighth of an inch, but cut this extension only 1-32 of an inch deep instead of the same depth as the part in which the ring fits. Then drill six 1-16 holes from this oil groove through the wall of the piston. The action of this groove is to collect the oil as the lower ring scrapes it from the cylinder wall and drain it back into the crank-case.

548 Auto Engine as a Power Plant.

From E. E. Marrs, New Hampshire.—I should like a little advice in regard to a project I am thinking of going into. That is, would a 60 or 70 h.p. motor engine be of any use as a power plant to do business with? Say to run a portable saw-mill, running the engine at its normal speed of 900 or 1,000 revolutions a minute, and running the saw at half that speed, using a 52 inch saw and having a governor fitted to the engine, also a heavy balance wheel. I am now running a 15 h.p. Reliance woodpecker engine and am sawing an average of 6 or 7 thousand feet of lumber per day, but find some work that is too heavy for it. I should like more power, but don't want to get a heavy engine to move around. Have talked to a number in regard to the motor engine. Some tell me it would work all right and some say it would not, so hardly know what to do. Have thought you would be able to help me if anyone could.

Also can you tell me what makes a four-cylinder air cooled Corbin engine heat up in running a short distance? It is a 35 h.p. car and has always gone right till a short time ago when it began to run hot and stop on us. It has been overhauled and everything done to it that could be thought of, but still it insists on resting every 10 or 15 miles.

I also have a Cadillac single cylinder car with 28-inch wheels. The sprockets are 9 and 34 teeth. How

much more power would it give to change the rear sprocket to a 45 tooth one?

Reply.—We would not hesitate to advise you to use the larger motor for the work you require, as a high speed motor of 60 h.p. would not be much heavier than the low speed motors you now use. Also the cost of repairs would be less owing to the excess of power over that required to do your work making the motor run easily and at no time being strained.

Poor adjustment of timing and carburetor are no doubt the cause of your heating.

The gear change you mention would give about 1-3 greater power on hills on high gear.

549 His Firing Trouble.

From John Clark, Massachusetts.—I have a four-cylinder Brennan Motor that I use in a truck. I have worked two days trying to get it to fire on No. 1 cylinder. But I am not any better off than I was when I started. I have taken out both valves and ground them, also changed plugs. There are two independent systems, batteries and Bosch magneto. No matter which one system I run it on it will not fire on the No. 1 cylinder. If you can help me a little on this I will be greatly obliged.

Reply.—I wish I might see all those cars and prescribe for their ailments in person, but as I can't do that, the best I can do in this case is to refer you to our answer to Mr. Wilson in this issue, which case is similar to yours and ought to be treated in the same manner for the best results.

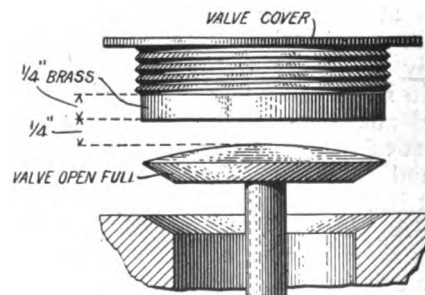
550 A Jumping Fly Wheel.

From Becker's Leather Goods Co., Washington, D. C.—We have a 1910 model, 40 h.p., 4-cylinder, 5-passenger, touring body, Marion car. It has been in use just 1 year and gone about 10,000 miles. When the clutch is let in the fly wheel jumps back about 1/4 of an inch. Should they have as much play as this and if not do you consider it dangerous to run the car in this condition? What is the cause of this and will the engine have to be knocked down in order to repair it?

Reply.—This jumping of the fly wheel is due to end play in the crankshaft, or the wheel is loose on the shaft and should be attended to at once as it is liable to cause damage to other parts of the motor.

551 Increase of Compression.

From E. C. McC., New Jersey.—Will I get more power out of my A A 12 h.p. Maxwell runabout if I add circular pieces of brass a quarter of an inch thick



to the inside of my exhaust and inlet valve covers so as to increase compression? This would leave about 1/4-inch between the valve head and the brass piece when the valve is full open. Would this increase the power noticeably? Would it tend to throttle the incoming or outgoing gases? Would the increased temperature give lubricating trouble?

Reply.—Other things being equal, the higher the

compression the greater the power efficiency of the engine. In accordance with this view it may be noted that the modern and improved engines strike an average of compression of about seventy lbs., while in the earlier models it is below fifty lbs. to the square inch. You should remember, however, that compression has certain limitations and beyond a certain point of pressure the efficiency ratio begins to decrease rapidly. It should likewise be remembered that to produce a higher compression, a greater amount of power must be absorbed.

We do not believe that the increased compression you contemplate would noticeably increase the power of your motor. At all events, before you attempt to do anything of the kind it would be advisable for you to consult the Maxwell Company in Tarrytown, New York. We feel sure they will give you a courteous and honest reply.

While the proposed increase in compression would surely increase the temperature at the point of ignition, it might not give lubricating trouble.

552

A Spark Plug Protector.

From D. E. Jonson, Arizona.—I would be pleased to have some one through your paper advise me how I can arrange the spark plug and the carburetor on an Orient Buckboard car, so that I can keep off the rain, or water. Anyone that has used the first ones that were turned out knows the plug and carburetor are set. This car was about 5 years old when I got it. I have had it a year and it runs as good as ever. I would not trade it for any horse and buggy on the market, for my personal use, but I can't use it in the rain. As I am crippled, that is the time that I want it the most. The only trouble is that I can't carry over 350 pounds in weight on it, but for individual use around a town it can't be beat.

Reply.—Any Auto Supply house can supply you with a porcelain spark plug protector which is in the form of a cup that may be set down over the plug. This will protect the plug from the rain. The only part of the carburetor needing protection is the air intake to prevent water getting in. This may be done by either turning the air intake downward; or if it is not reversible, a pipe may be fitted to give the same result.

Struck by Lightning.

From A. D. Dougan, Iowa.—Please give us a scientific reason why a car or people riding in a car in a bad electrical storm are liable to or not to be struck by lightning. And please ask for proofs of any theoretical view from your subscribers, if they know of automobiles being struck by lightning.

[Note by the editor.—The subject of lightning and electrical charges and discharges is one that is not yet thoroughly understood and upon which scientists seem to differ. Although we should have been likely to hear of it if automobiles are frequently struck by lightning, we have no recollection of anything of the sort. Whether the rubber tires and the abundance of steel and other metals make the automobile less or more dangerous than normal conditions, is not yet determined, as far as we know. Possibly some reader may have distinct views or experience upon the subject, and if so, it would be a favor if he would contribute it for the benefit of others. One thing, however, can safely be advised, and that is the old adage slightly paraphrased: "When out in a car wherever you be, if it thunders and lightnings, beware of a tree." This is not very good English, but it is good advice. In a thunder storm, keep away from the shelter of trees.]

Mr. Pembroke on Certain Motor Troubles.

From C. J. Pembroke, New York:—I note the article by Mr. F. P. Tolles, wherein he says that he hopes I will keep up the fire. By this I assume that he wants more criticisms, but I would rather praise than criticise, exploit rather than contradict, although I am free with my criticisms or contradictions, provided I am thoroughly satisfied that the information given is either incomplete, erroneous or misleading to the extent that it is liable to do harm.

As the opinion of two mechanics will not at all times agree, and even if they do, one will express himself different than the other, so it will be plainly understood that while I read very carefully all of the answers to the "Trouble Department," I would only criticise when I see something that if followed would injure your machine, and would offer additional information only when I think it would help a great many readers, and then only, provided I had not offered the same character of information in some previous issue or had not seen it offered by the regular expert, or some other contributor. I have but little sympathy for those who do not keep in touch with such valuable information as is contained in a first-class automobile journal, for although I feel that I am as well posted on gas engines as any human being could be after fairly living with them for eight years and following all their progress, their ups and their downs as only a hobbyist could, yet I must confess that I still read eagerly every scrap of information that I am able to obtain no matter what may be the source. I assure you I find in the answers to trouble more little kinks than from any other source, because it shows where the weak points are located, while with others who like myself are continually designing and building different parts that enter into the construction of a car, it helps to avoid the things that have caused trouble for others. My advice is, read everything that you see printed but try to learn how to separate the good from the bad.

But I wish to criticise the department, because they do not give the full address of the party making the inquiry. Now for example I would like to write a letter to Mr. C. A. Meyer, explaining to him what I think is causing his trouble, which is a very peculiar one, the like of which I never before heard. What I would like to say would require too much space so I must cut it down to a few words: Mixture too rich and using a low test gasoline, with a low compression (this last is probably a feature of the motor). The rich mixture does not fully vaporize in a cool motor. Thus not showing itself to be rich. This would be more true the lower the compression and the poorer the fuel. Then as the motor heats up the fuel vaporizes more easily, thus causing the mixture to become still richer and the compression also becomes greater, which also tends to more thoroughly break up the gas and still further vaporize the gasoline in the charge, until after the motor has been run long enough so that all of the gas is thoroughly mixed and makes what we might call chemically, a perfect mixture, when it becomes so rich with the hydro-carbon as to have passed the point where it is possible to ignite it and the motor fails to run. After allowing the motor to cool off again, then the first gas that comes is only partially mixed with the air and the mixture in general does not appear to be rich. Suppose he stops his machine after he has been running it and he first begins to realize that it is skipping, and with the motor running, opens up the auxiliary air valve or by cutting down the gasoline by means of the needle valve. If he can stop the skipping it

shows that I am right, but if the motor will do no better and the skipping continues, then this theory is all wrong. He will see that by letting in more air by means of the auxiliary it will not disturb his needle adjustment the next time that he wants to start the cold motor and will be better than adjusting the needle which will throw it out of tune for starting.

497—Mr. J. S. Minor, I think all your trouble is located in a grabbing clutch. I once had a bright idea of taking out a patent on a clutch that would first take up the load by friction, and then by making a positive engagement, I thought that I would avoid what is known as a slipping clutch. However, I first made a model and tried it out and much to my surprise and disappointment, I found out that when there was no slip in the clutch that it caused the car to go forward in a decidedly jerky manner, so I think that a little castor oil judiciously added to your clutch would relieve your trouble. Needless to say I did not take out the patent.

An Interesting Experience.

From F. W. Simmons, Texas:—Recently a 70-mile run was made with a model "Q 11" Maxwell. It was a great surprise to run out of gasoline when within 5 miles of home. Careful examination failed to reveal any leak—and finally it was concluded to consider it an unsolved mystery.

About ten days later, preparatory to an early start, the car was "filled up" the evening before. The next morning, after backing the machine out, the garage floor revealed an uncommon amount of moisture. The radiator was found full of water, and no leak visible; but the gasoline tank was almost empty. It was reasoned that this tank must be defective near the bottom. It was removed and found perfectly sound, as well as the pipes and connections. The difficulty was found in the float valve of the carburetor, which would, at times, hang and sink, and thus not cut off the flow of gasoline, which had wasted. After the carburetor had been repaired and replaced a very mysterious thing happened. A well defined screech indicated the urgent need for lubrication somewhere. The bearing of the radiator fan was oiled, then a drive to a nearby garage for gasoline where this machine received the attention of a score or more persons in a vain endeavor to locate the "tight bearing." Slowing down the engine and cutting in and out the battery switch just before the engine stopped, developed at slow speed, a wonderfully agonizing screech which was also readily detected when cutting off the current and spinning the crank. Knowing the fact that the machine had not been used regularly prior to this, had much to do with the imagination—being sure oil was badly needed somewhere. The trouble was found to be in a defective gasket where the carburetor attached to the intake pipe, permitting an inrush of air, whistling, imitating what was judged to be a hot bearing. An annoyance chargeable to the want of thoroughness on the part of the repair man.

Cure Suggested for a Rattle.

From Edw. Barnett, Illinois:—I would like to offer a suggestion to W. M. H. of Maine as to the rattle in his Ford T. If he will tighten the bolts in his muffler, the ones that hold the ends together, he will find that his noise is gone; at least I find that is what causes it. I have fixed several that way. The inside lining of the muffler gets loose and causes a roaring noise when the engine is running from 20 to 30 miles.

I notice some Ford owners are having trouble with

their cars getting too much oil, causing carbonizing in their cylinders. If they will take a cold chisel and cut out the partition in the crankcase, and solder up the rivet holes, so it won't leak, file off the connecting rod dips, they will have no more trouble.

The Ford Motor Co. are sending out all their new motors without the partition in the crankcase and minus the oil dips.

Vulcanizers and Coil Troubles.

From H. J. Buckmaster, Ohio:—In regard to the question asked by a brother reader from Connecticut in your March issue on vulcanizers, I wish to say I have a National Steam Vulcanizer that does work simply fine. I would not do without it for ten times its cost. I paid \$8.50 for mine last year and it will save its cost many times in tire bills.

In regard to the answer to my question by Charles A. Meyer on coil trouble, I believe they are "all in the woods" in regard to the actual trouble. It might be well to state that the coil does not miss unless it gets damp. It is all right when dry. The trumpler works but no spark comes from the secondary wire when the coil gets damp. It is also very economical on batteries. Would like to have someone explain why it will spark when dry and not when damp.

I would like to hear from someone who has used the preparations to put in radiators to stop leaks. Will they stop leaks without stoppage in the tubes?

Bearings and Valve Grinding.

From W. M. H., Eastern Maine:—I would like to say to Dr. Tillotson that his Model T motor bearings need "taking up," or plainly speaking, adjustment, for the Model T Fords in this section are all quiet running and leave no "metallic click." Also, for a slipping fan belt, I think it would be very much better to cut a small piece from the belt and lace it in good shape, cutting enough from belt to compress the spring under the arbor. A good part of the trouble from overheated Model T engines is due to poor lubricating oil, or not the right kind. The Underhay Oil Co. of Boston, make a good grade of oil for the Model T and we ran nearly four thousand miles last season using this oil and experiencing no trouble.

When grinding valves I use a Yankee No. 30 Spiral screw driver and by placing a weak spring under the valve and pumping the spiral screw driver, reversing the direction once in a while and "lifting" for a new seat, I find it a good time saver.

Experience with a Vulcanizer.

From C. F. Menill, Illinois:—I would like to give the brother reader in the March number of the Automobile Dealer and Repairer my experience with a vulcanizer.

I drove my car five thousand miles with no expense to the tires whatever. Last fall when I removed them for the winter I inspected them very closely and found forty-two places, ranging in size from a pea to a sand boil three by seven inches, that needed repairing. Any local repairman here would have charged \$30 for repairing them. I bought a Shaler Electric Model D No. 81 vulcanizer and \$1.80 worth of material of which I used about one quarter and studied the directions closely and devoted my evenings for about two weeks to the work and now I have my tires in first-class shape and good for another five thousand miles from all appearances.

Needle Valve and Bearing Trouble.

From F. J. Claussen, California:—In answer to question 511, in the March number, from Geo. R. Leonard, I will say the needle valve has not enough taper. When opening the throttle more than half way the inrush of the gasoline is so heavy that it chokes the motor. He should take the needle valve out, put in a breast drill, place the point against a piece of hard wood and turn, while someone else holds a fine file against the valve and thus make the taper longer; then in order to make a perfect seat, put a little valve grinding compound on the point, put the point in a piece of soft wood and turn, till all file marks are gone. This will make a good job. He will then be able to open the throttle wide. I have just gone through that experience with a Model F Schebler.

Concerning question 495 March number, from J. S. Smith, if he will take up the main bearings in the engine, or lower his transmission a little, the grinding of the clutch when running idle will stop. The reasons are that every explosion of the motor comes directly on the lower half of the main bearing, and as Mr. Smith's car is an Auto car he will find bronze bearings. Of course they are bound to wear, and this will lower the crank shaft, also the fly wheel. The clutch and transmission not being subject to such pounding will remain in the old position, and when running idle the clutch will rub the top of the fly wheel and there will be much strain on the transmission.

Ford Fly Wheels.

From W. D. Murray, Michigan:—In answer to No. 491, I have got a Model N Ford. I had a ring weighing 23 lbs. shrunk on my fly wheel. I furnished the casing, which was a broken fly wheel and a man did the work for \$5.50, which is a dandy job and cheap too. Now I would not have this ring taken off for fifty dollars. I can run my engine slow now when it is idle, and on short, hard pulls, where I used to have to go on low, I can make on high now. My engine never stops with a chug as it used to. As to putting in a plate to raise the compression, anybody knows how compression is apt to make the engine noisy. The Model N., R or S engine is noisy enough already. I would not advise anyone putting on over 30 lbs. as in changing from low to high this heavy fly wheel brings a very hard strain on the crank shaft. It only cost me \$35 to find this out. Ford cranks are good little fellows but they cannot stand everything.

An Auxiliary Engine Base.

From F. R. B., Michigan:—I have a model T Ford car and every time a bearing gets worn or there is a knock in the engine, it costs me from \$20 to \$30 to tear down the machine, find out the trouble and re-assemble the car. The Gardner Engine Starter Co., of Chicago, make an auxiliary engine base for Ford cars which they claim lessens the expense. Do you think it all right? Have any of your readers tried it on their machines?

[Note by the editor—If any reader has used this device we should be glad to hear from him in response to the foregoing request.]

The Leaky Kingston Carburetor.

From F. N. O., Illinois:—In your reply to question No. 526 with reference to a leaky Kingston carburetor, I would like to add my experience. I had the same trouble that P. C. B. of Michigan experienced on his Brush, and I took the matter up with the manufac-

turer, and he suggested that the leak was due to a leaky gasoline valve. On removing the valve, I found it worn and when replaced with a new valve the leak ceased.

The Kingston has a square valve seat, and the vibration of the car results in a worn valve. A "loggy" float on the Kingston carburetor is very rare indeed.

The Leaky Carburetor.

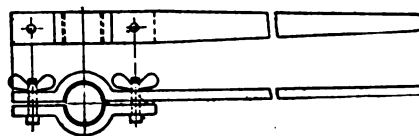
From J. A. Fellers, Elk Creek, Nebraska:—I note what you say in your answer to P. C. B., Mich., No. 526, and do not fully agree with you. I have a Brush and have had the same trouble, and the way I fixed mine was to put in a new needle point just where the gasoline enters the carburetor from the pipe that leads from the tank, and I think if he will examine his he will find that the point he now has in is badly worn and will not seat so as to shut off the gas if the float is all right. Will say mine bothered in running, for at times I could not stop the flow as I wanted but it did not run over or leak while the engine was running.

From Charles E. Miller, Indiana:—Those with limited capital who operate small automobiles and want to make their money go as far as possible in tires can do so by using second-hand tires of larger diameter than were originally on the car. For instance, if you have a car with 28x3 tires, get a good second-hand tire, 32 or 34x3½, and cut a section out of the tire where the blow-out is, reducing the tire to fit your wheel. See that the two ends of the tire are square and fit neatly together. Punch a row of holes with a belt punch ⅛-inch in diameter. These holes should run from bead to bead one inch apart and each row should set back about one inch from the joint in the tire. Then take common, flat belt hooks and drive them through these holes and clinch on the tread of the tire. By bending the hooks down you can draw the ends very tight together. A little cement will be a very good thing. Your casing is now ready to apply to the wheel but when you put your tube in, wrap two or three plies of uncured tire fabric about four inches wide around the inner tube where the joint is in the casing.

Tires of this size on a small car will run three to five thousand miles quite often.

Grinding in Crank Pins.

In overhauling and repairing automobile engines, the crank pins are often found to be badly cut or worn, due to lack of proper lubrication and the subsequent overheating. In most repair shops all sizes and kinds of engines are met with and it would be



For Grinding Crank Pins.

considerable trouble to rig up a lathe with arms for centering cranks of different throws in each case to properly remove the scored marks by a machine tool.

The little device, shown in the accompanying sketch, for grinding or lapping in the crank pins has been used with good results. Take a piece of wrought iron, 5-16 by 1 1-4 by 20 inches long, and bend it as shown in sketch, likewise a piece for the under side. Drill two holes in them for bolts with thumb nuts for clamping them together. Caliper the crank pin to be lapped and then turn up a pin 1-8 inch less in

diameter. Set the pin in a central position between the two bars and pour melted lead about it as you would to form a bushing. Split the lead so that the device can be clamped over the crank pin. By applying oil and emery dust to the inside and moving the handle laterally while the crank is revolved in a lathe, the pin will soon be ground smooth and true all over. Pressure should be kept on the pin by means of the two thumb nuts. Use coarse emery at first and fine for finishing. When through grinding, care should be taken to clean all the emery dust from the crank.

Polarine Lubricates Anything.

From H. K. McCann, New York.—The queries and comments which have appeared recently in your columns present seriously mistaken ideas as to the nature and characteristics of Polarine, the brand of motor-car and motor-boat lubricant manufactured by the Standard Oil Company. One correspondent goes so far as to say "Polarine is a gear grease and not a cylinder oil."

The fact is the Polarine brand includes every grade of lubricant used in an automobile. Polarine oil is for the motor proper—Polarine transmission lubricants "A," "B" and "BB" are for the varying types of transmissions and differentials; while Polarine cup and fibre greases are for universal joints, ball and roller bearings, and any other parts where a solid lubricant is desired.

By correcting the misapprehensions on these points which have crept into your columns, you may save many of your readers from needless mistakes and troubles.

[Note by the editor.—Information of about the same effect has already been stated in a previous number, but it will do no harm to repeat it. Quite likely the error referred to originated by the use of what is practically the same name for several specific articles.]

Two Cases of Heterophemy.

From C. H. D., Connecticut.—In his article in the April issue, James F. Hobart talks about a car "running 30 miles an hour or 44 feet per minute." Ask Mr. Hobart to sharpen his pencil and see if such speed isn't about 2592 feet per minute.

[Note by the editor.—Will our friend sharpen his pencil and see if such speed isn't about 2640 feet per minute? It is easy enough to be mistaken, but Mr. Hobart has been dealing in the eternal verities long enough to be accurate. Quite likely he was momentarily inflicted with "heterophemy,"—thinking one thing and writing another. He thought second but wrote minute.]

Driving and Operating.

There is a vast difference between the mere driving of a car and intelligent operation. Simply driving a car does not mean anything. A team of horses in the hands of a novice will cover the route, but their efficiency is lessened by the incompetent driver. So with an automobile. The proper shifting of gears and application of power at the proper time determines the efficiency and life of the whole mechanism. In the hands of an untrained person the highest grade car will rapidly depreciate and be in need of constant repair, while the trained operator will prolong the service of a lower grade car indefinitely.

Although manufacturers design their machines anticipating inexperience on the part of the operator, yet when one considers the great variation in speed demanded of a car and the vibration it receives due to

varying road conditions, it seems most unjust to the car and its maker to expect service in return for abuse.

If owners would take the time and trouble to properly master their car they would have less trouble and expense and would realize real pleasure and value from the investment. The pleasure in automobiling lies in knowing how to drive properly and in feeling confident of making repairs in case of necessity.

A Garage for \$150.

From R. L. Teeter, New York.—In answer to your request for plans of private garages, I send the following: The garage is 14 x 20 feet, on cement walls, which extend below the frost line and 8 inches above the floor. There is a stone cesspool in the center and the concrete floor slopes so that all drip from the car, also water when washing, runs into the same. The concrete floor is 4 inches thick. The approach is also of concrete. Sills are bolted to the walls with $\frac{1}{2}$ x 12 inch bolts set in concrete when building the wall. The studding is 2 x 4 inches x 10 feet, spaced 2 feet on centers, covered



Mr. Teeter's Garage.

with cone siding. Gable roof shingled. Double windows on each side. Matched battened down swinging out. Windows could be placed in the same at a slight additional expense. This garage complete as described and as per photograph enclosed, painted two coats, cost \$150, and makes a substantial garage. The arrangement for bench, oils and gasoline can be fixed to suit the owner.

Adjusting Carburetors.

In an address on carburetors a teacher in the Stewart Automobile Academy of New York City, said recently: "Carburetors using an adjustable nozzle and a main air-passage only, are used on very small cars. In this the needle-valve is to be opened one complete turn, and the motor should be started with throttle one-quarter open. The engine must run slow and the needle-valve adjusted to where it runs fastest for that position of the throttle. To adjust carburetors using one adjustable nozzle, and an auxiliary air-valve with a single spring, the needle must be opened one-quarter turn, with the air-valve seated. The engine must then be started, and after the spark is properly advanced, slow down the engine and adjust the needle-valve for very low speed until the engine runs smoothly. Then the throttle must be opened wide to note the action of the motor.

"Should the engine have a tendency to speed up and then back-fire and stop, too much air is being supplied by the air-valve. To remedy this the tension on the valve spring must be increased until the maximum

speed of the engine is obtained. But should it be found that in order to obtain this high speed it has reduced the travel of the valve to about an eighth of an inch, a spring with slightly greater tension will be required. If upon opening the throttle the engine increases the speed, but gallops and the exhaust sounds very heavy, the spring tension must be diminished to admit a greater amount of air."

Look Out for Inferior Coils.

Though a coil may be ever so good still it may fail to do what it should simply because the user or the seller has sought to save or to make a few pennies by employing with the coils inferior contact screws and vibrators. So prevalent has this practice become in certain quarters that one manufacturer has been forced for his own protection to issue this warning:

"In all cases brought to our attention these spurious parts are poor imitations of the original. The platinum contact points, both on the screw and vibrator blades, are much thinner or smaller in diameter than those furnished on the genuine. The vibrator blades are made of a very much lighter spring stock and of inferior quality to the genuine, with the result that the coil will fail to act properly, missing and not giving the engine its proper power, which would, however, be secured with genuine parts used under the same conditions.

"Some of the spurious parts which have come to our attention have been made of a stock not much better than tin and several thousandths thinner than the genuine. In addition to this the contact points are much smaller, and in a good many cases, of an inferior grade of platinum. We have also found in some cases where steel, german silver and other alloys have been used in place of platinum, with the result that they would quickly ruin the coil by breaking down. The genuine are fitted with the very best grade of platinum-iridium obtainable, and the most expensive material for the purpose. In addition to this the armature attached to the end of the vibrator blade is of a stock not suited to be quickly magnetized and demagnetized."

Looking for Cheaper Cars.

It is not explained why the automobile trade expects the \$500 car to seat four or five persons to be along in 1915, but that is the talk, although the chances are rather against it. The machine is expected to be a four-cylinder car. It will be of twenty or twenty-five horse power. In that day, the automobile dealers now believe, there will be 1,500,000 automobiles in use, or about one for each seventy inhabitants of the United States.

When an automobile is \$500 only, the manufacturer figures that every farmer in the United States will own one as well as every salaried worker who has an income beyond his needs. It is on the idea that well-to-do world will be well supplied with high-grade cars at a fast rate of manufacture now maintained, and that new business will be required to keep up the increasing pace that the year 1915 has been pitched upon for the output which is sooner or later, to make almost every man an automobile owner.

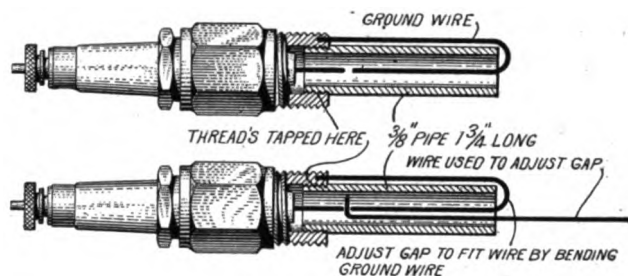
Two Anti-Skids Only.

In a recent interview J. Hauvette-Michelin, head of the tire works at Milltown, N. J., stated that the greatest drawback to a more general use of anti-skids in this country has been the added cost, as the motorist already has a complete set of rubber-tread tires, which he does not want to discard.

"As a matter of fact," continued Mr. Michelin, "four anti-skid tires are not necessary, only two being required to assure safe driving under all road conditions. One anti-skid should be fitted on one of the front wheels, and one on the opposite rear wheel. If the driver sits on the right side, then the best disposition of the anti-skid tires is one on the right front wheel and one on the left rear wheel; but if the car drives from the left side, like Reo cars and Fords, then the anti-skids should be fitted to the left front and right rear wheels. Of course, the two rubber-tread tires that are removed when the anti-skids are fitted may be kept for spares for the two wheels still carrying ordinary tires.

His Remedy for Oil Flooding.

From C. L. E., California.—I am the owner of a Buick model 10, 1909, and have had a great deal of trouble with the oiling system. But at last I have made a discovery which overcomes that difficulty and thought perhaps it would interest your readers. My trouble has been the front and back cylinders in the hilly country. When I climbed up hill the back cylinders would flood with oil, caused by the oil rush-



ing into the back of the crank case, consequently covering the spark plugs with oil and short-circuiting them. The same trouble was experienced going down hill. My motor would miss fire if it showed the least sign of smoke from the exhaust, and I couldn't seem to throttle it down below 15 miles an hour on the magento, caused by oily spark plugs. No matter how often I cleaned the plugs they were always dirty, especially the front and back ones. The back cylinder had all new rings on it and seems to let more oil by than all the others. As soon as the oil got down pretty well in the crank case the engine ran much better, but it wasn't safe to run it so low. Once when I took off the bottom of the crank case I didn't have three tablespoonfuls of oil in the bottom partition. Of course the pump wouldn't send it through the glass on the dash except once in a great while and the engine showed signs of knocking on level roads for the want of oil. I have been using Vacuum oil and Rajah spark plugs, but have found the Vacuum A oil too light and have changed to Vacuum B oil. I have also remedied the front and back spark plugs.

Now my theory in regard to the spark plugs is this: Most all plugs, when screwed in tight, come flush with the inside of the wall; that is, the end where the spark occurs, and when the oil goes up by the piston rings it covers the side walls and top of the combustion chamber, causing the oil to run back into the plug and onto the porcelain, especially when the plugs screw in from the side of the cylinders like the Buick engine. Where the plugs screw in from the top of the cylinder there does not seem to be so much trouble, as the plugs can drain out where side plugs will stand full for hours. I used ordinary spark plugs, and took the side or ground wires off, took out the porcelain and tapped threads inside to fit 3-8 inch pipe. Made the pipe about 1 3-4 inch long, and then

replaced the little short ground wire with one long enough to reach out to the end of the 3-8 inch pipe, and back through the center, and then after putting porcelain back, I adjusted the gap to 3-64 inch. That caused the spark to occur in the same place as before, but is covered by the 3-8 inch pipe, consequently, the oil will run down over the pipe and not affect the pipe a bit. That causes the plug to stick out in the combustion chamber about 1 3-4 inch where it is dry. There is plenty of room in the Buick engine so the valves or piston doesn't come in contact with the 3-8 inch pipe. Care must be taken to tap a "shy" thread in the plug so that the 3-8 inch pipe will fit tight and not let oil in on the porcelain. They are very easily fixed and can be done with very little cost. I still use the two Rajah plugs in the two inside cylinders. With the Vacuum B oil and plugs as they are now, I can fill the crank case up to where all bearings are properly lubricated and not have any signs of missing. I can also throttle it down to seven miles an hour on the magneto. Another good advantage of the Vacuum B oil is that it gives better compression and more power. I don't suppose those plugs would work in all kinds of engines, especially where the plugs screw in from the top of the cylinders, as the piston might come in contact with the 3-8 inch pipe. But it works in the Buick with fine results. I enclose a sketch which may help you to better understand my description. The ground wire I put in has a tendency to hold the 3-8 inch pipe in case it should happen to come loose, and at the same time would put the plug out of commission. But this does away with all my former trouble, thanks to the made over spark plugs. I hope this may be of benefit to others who have had the same trouble I had.

Use of the Spark Lever.

Many drivers throw the lever back before cranking, and place it in a forward position after the motor is started, because they have been told to do so. They do not try to study out any reason for it. They seldom determine the proper position of the spark; therefore, you will hear many motors pounding, due to a too high spark, rather than to carbon or any other cause. The fact is that about 50 per cent. of motor efficiency is lost by having the spark placed in the wrong position. The full power of the motor can only be obtained by proper carburetor adjustment and advancing and retarding the spark in conformity with the motor speeds. The time of the spark must change as the piston speed changes. This is due to the fact that the most perfect mixture takes time to fully ignite. It requires only a small fraction of a second, yet when the motor travels at 1,200 to 1,500 revolutions per minute or more, the time taken by the piston at the compression center is infinitesimal. Many crank shafts and connecting rods are broken by improper use, or rather poor judgment in using the spark in climbing hills.

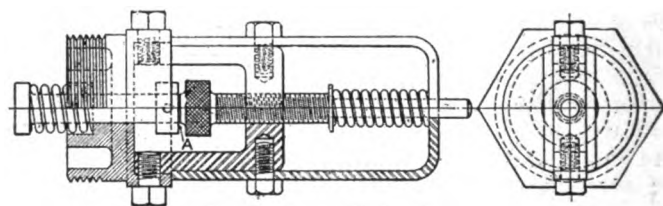
Auto Retail Delivery Service.

The development of the commercial car has reached the stage where it is not necessary for the merchant or delivery service man to ask if it is practical, but rather, which type is most practical for his purpose and the conditions of the roads within his territory. Merchants of all classes in large cities and small towns realize that one of their most difficult problems is that of making deliveries. Prompt delivery service is an asset worth many hundreds of dollars. As a motor-propelled vehicle can cover three times as much mileage in a given time as a horse-

drawn wagon, it stands to reason that deliveries will not only be prompt but the service can be extended many miles, thus increasing the territory from which trade may be drawn without increasing overhead expense. Where one merchant is unable to afford a delivery car he should combine with two, three or four others, and thus secure not only the cheapest but the most prompt delivery.

Gauge for Valve Timing.

A device for a gas engine valve timing gauge that will prove useful to automobile repairmen is shown in the accompanying sketch. With this device the valves can be timed more accurately and with less trouble than by the old screwdriver method. In use it is screwed into the valve plug hole in the cylinder with the lower plunger resting on the valve. Adjust the top plunger so that a thin sheet of tissue paper will just slip in between the ends of the plungers at A.



Detail of the Timing Gauge

Now turn the flywheel slowly and as soon as the paper is gripped by the plunger you will know that the valve is just starting to open. By turning the flywheel in the same direction until the paper is released the closing point of the valve can be determined. As the paper in question is but .001 of an inch thick great accuracy can be obtained with this gauge.

Worm Gears Improved With Use.

The writer, who has had considerable experience in worm gearing, finds that the average efficiency is approximately 90 to 91 per cent. new to as high as 94.6 after continued use. This rise of efficiency on the part of worm gearing as its life proceeds is noteworthy. It is easy, however, to predict the effect since every turn of a gearing properly mounted and suitably lubricated simply increased the degree of polish of both worm and wheel surfaces, causing them to approach more nearly the truly smooth condition demanded.

Thus the efficiency rises and the liability of wear decreases with the continued use of the gear. This is decidedly borne out in practice and in pleasure automobiles' construction it is no uncommon thing to find an axle that having run better than 50,000 miles in hard surface shows no signs of wear in the gears. The importance of this difference between worm gearing and other forms should not be overlooked, since with bevel and spur gears the commencement of wear is but the beginning of the end and, instead of improving with life such gears steadily depreciate.

Spare Air Tubes.

Many motorists do not take sufficient care of spare air tubes when these are carried on the car. Quite a number of times recently spare tubes have been seen loosely thrown into the tool box, unprotected from oil, grease, and the sharp edges of loose tools. Spare tubes should be carefully rolled up flat, the interior valve parts having been removed, so that all the air may be forced out; the valve parts should then be replaced and the tube packed away in a grease-proof bag containing a good sprinkling of French chalk.

AUTOMOBILE PAINTING.

The Best Material for Chassis, Engine and Mudguards.

From Edward C. Kern, New Jersey:—In your answer to painting query, what kind of color do you use for black finish, is it drop black ground in oil or Japan? Would finishing varnish at \$6 per gallon do just as well as rubbing varnish? Would finishing varnish, mixed with a little linseed oil, lead and color, do for the gear? What is the best kind of paint for the chassis, engine, and mudguards? Describe the way to do it so it will stay on so a novice will understand.

Reply by M. C. Hillick:—For automobile work use drop black ground in Japan. For the first coat of black break the pigment down with turpentine, adding the thinner gradually, and then to every 9 parts of the turpentine use one part of pure raw linseed oil. This will give the color plenty of binder and elasticity without in any way interfering with its rapid drying qualities.

Finishing varnish, regardless of the price paid for it, cannot be substituted for rubbing varnish in bringing up a varnish foundation. Finishing varnish is just what its name implies—a material to round out, and protect, and make brilliant, the surface brought up with various coats of paint, color and rubbing varnish. Rubbing varnish is also just what its name implies—a varnish that dries hard and stands rubbing with water and pumice stone flour, a line of treatment which the highly elastic finishing varnish cannot be made to submit to. In other words, rubbing varnish is made solely for building up a fine, smooth, and level surface, over the color coats. It is composed of gums, and turpentine, and other ingredients which contribute to cause it to dry so hard and firm that it can be rubbed with pumice stone flour and water to a smooth and level condition. Finishing varnish, on the other hand, is composed of, among other things, an excess of oil which gives it the necessary elastic properties to wear and protect the under coats. For this reason, if for no other, finishing varnish cannot be made to take the place of rubbing varnish or *vice versa*. Each has a separate duty to perform upon the automobile. Our correspondent and all others not possessed of an exact knowledge of the status of the varnish question should keep this distinction clear.

Finishing varnish used in connection with linseed oil, lead, and color, would be of no benefit to the resulting mixture. If anything, it would tend to make it a mongrel concoction.

For the chassis with the paint worn and deficient in elasticity and strength break up some pure white lead ground in oil and mix to a working consistency in three parts turpentine to one part raw linseed oil.

Color the mixture to a strong match with the final color to be applied to the surface. Add to a pint of the mixed lead 15 drops of brown coach japan. Sandpaper the surface well before applying this lead coat. Apply the lead with a 1¾-in. camel's hair brush, and lay it all out very smooth and clean. When dry, putty all defects and cavities with hard drying putty—that is, a putty composed of dry white lead, 3 parts; refined whiting, one part. These ingredients mixed to a proper working consistency in equal parts of brown coach japan and rubbing varnish. When this putty has dried hard and good sandpaper it down smooth and nice and apply, for first class work, a coat of "dead" lead, i. e., lead mixed to a working consis-

tency with turpentine, with a few drops of oil added to hold it in position when applied to the surface. It should dry out flat without any apparent gloss. Thereby it derives its name of "dead" lead. In due time, sand this lead, and over it apply whatever color is selected as the final one, which color, of course, should always be a japan ground one.

The mudguards should be brought up in the same way, if the surface of these parts warrants the outlay, and carried to a finish as thoroughly as the body.

To make it plain as possible, if the mudguards are worn, and the paint and finish is flaking and scaling, scrape and sandpaper the surface down and apply the coats of lead recommended for the chassis. Then putty, putty glaze, and sandpaper, apply one or two coats of color, and a coat of varnish-color, two coats of rubbing varnish, stripe, if necessary, and finish. The striping, however, should, invariably have one coat of rubbing varnish over it. These processes should give the mudguards a finish that will stay. For the chassis, above the lead coats, or upon a sound, good foundation of old paint, without the lead, use japan ground color. As a matter of fact, all parts of the automobile, once the foundation is well established and made secure, should be coated up with japan ground colors of prime quality. Put over this color a coat of varnish-color, and three coats of varnish, and, given reasonable care, the finish is sure to give a good account of itself.

Finally, all varnishes—all materials of every kind, in a word—should be of the most approved quality.

Daily Examination.

From E. W. Longnecker, Indiana.—The more closely nature's laws are followed in the race of life the better we succeed and the better our physical being is preserved at a ripe old age. The same is true of the life entrusted to our care in the form of domestic animals. The rule continues to hold good in the life or durability of machinery which we undertake to handle and operate. Man perverts nature's laws and abuses his own body by over-indulgence in vicious habits. By these means his life is prematurely snuffed out. We note similar results in the life of the horse where, by comparison, we see one of 12 years old not able to accomplish equal service with another at 20 years old in different attendant's hands. The cause for this can generally be found in the kind of care given to each of the two.

Nature's laws have been disregarded in the one instance and more closely followed in the other. Those most successful along this line have long since learned that regular feeding habits and a daily grooming succeeds best in the care of domestic animals. It is the daily grooming of the gasoline engine that we wish to emphasize in this article.

When in constant use it is as important to give an engine a daily grooming as it is to give the horse a daily grooming. The man who neglects to do this is not operating his engine on a very substantial basis. He will run into trouble much sooner than necessary if not sooner than he expected. The operator who makes daily grooming one of the fast hard principles in the care and attention of his engine seldom has any trouble and never expects any with his engine, because he feels assured that in the careful and regular attention he gives to it he will be able to detect the irregularities that arise, in time to prevent any trouble that may arise.

Daily overhauling therefore not only does what is

absolutely necessary to keep the engine going for the day but it also fortifies the operator in making him thoroughly familiar with the location and function of every working part of the engine. By thus knowing his machine he is able to judge of the condition of each working part, and supply lubrication where and when needed, to guard against undue wear of the parts and to adjust any loose nuts, screws, etc., before any damage results therefrom.

Grooming of the engine therefore, is to it what the daily grooming is to the horse. While cleaning and oiling in this daily overhauling is of the utmost importance it is by no means all that should be considered. It should be made a search to determine whether every part of the engine is in perfect trim for its day's service. Are there any loose bearing that rattle and clatter while running? If so the daily grooming is the hour at which they should receive the proper attention. Has there been any misfiring during the previous run? The overhauling is for the purpose of locating and correcting the cause of this trouble. Any undue knock or pound about the engine should be looked into in the overhauling.

If the daily overlooking is carefully and persistently done there is no room left for abnormalities, and the engine will be always and ever ready to do the bidding of the operator and go into each day's work fit for the heaviest duty it may be called upon to do.

Tire Protectors.

Since it is universally admitted that pneumatic tires are the source of more trouble and expense than any other part of an automobile, the matter of tire protection is one of especial interest.

The very great difference of opinion which exists among the users of tire protectors will generally be found to result from the fact that they have used different types of protectors.

The users should bear in mind that they are intended only to protect the tires from injury and wear. The intention is to protect good tires, to keep them good rather than to reinforce old, weak tires. To sum up the proposition of tire protectors, the automobilist on the one hand can, with a first-class tire protector, expect to be protected from a large per cent. of the punctures and other injuries to the tire; to have a non-skid always in place that will give the best possible hold on anything but ice and snow and if they are used over good tires, kept well inflated, he can reasonably expect at least twice as much service from his tires as he can obtain from bare tires. On the other hand, he will find that the protectors consume more power than bare tires, that they make a slight whirring sound on asphalt or macadam roads and that they slightly increase the weight of the machine, although but little more than a top or wind shield.

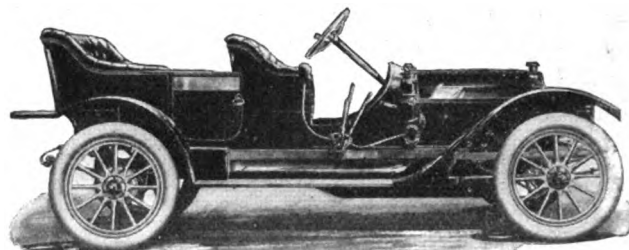
Starting on the Spark.

It is gratifying to a motorist to be able to start his motor by a simple manipulation of the spark lever, and this is possible with many motors nowadays. Very few engines will start in this way every time, but the chances of their doing so are increased if the throttle is fully advanced just before the ignition current is switched off. This causes the motor to make a number of quick revolutions after the spark is stopped, and the cylinders are not only thoroughly scavenged, but a rich mixture is drawn into them, which remains indefinitely, according to the balance of the motor, and its ability to hold a charge.

THE SCHACHT "40."

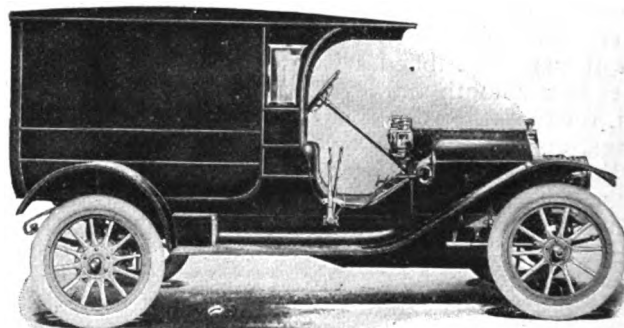
A Big, Efficient and Costly Car at an Unusually Low Price.

An attractive feature of the Schacht Line for 1911 is their 40 h.p. car for the price of \$1,535. The announcement of such a car with 120-inch wheel base and room for seven passengers for this price, naturally brings up the question of detailed specifications. The 1911 cata-



Schacht Model A-A Touring Car.

logue goes into this very thoroughly. The motor is of the regular four-cylinder vertical type with cylinders cast en bloc and integral water jackets, constructed to secure uniform circulation and cooling. It is 40 h.p. rated, having 4 5-16 inch bore, and a 5-inch stroke. The valves are all on one side. This construction saves a good deal of space, and adds strength and fitness to the entire motor. It also allows space for larger valves and dispenses with much of the water and empty pipe equipment. The gears are the noiseless spiral types, a great improvement on the old spur type. The cam



Schacht Model D-4 Delivery Car.

shaft is driven directly off the crankshaft, while the magneto and pump gear is driven off an idler gear from the crankshaft.

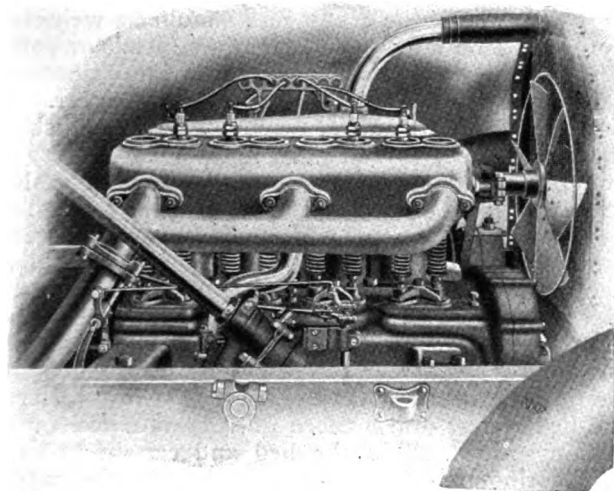
The crankshaft is made of special carbon open-hearth drop forged steel and is 2½ inches diameter in the center. This is claimed to be the largest crankshaft ever put into a four-cylinder car. The crankshaft bearings are also exceptionally large—the forward ones being 2⅞ inches in diameter and 4½ inches long and the rear one 2⅞ inches in diameter and 4¾ inches long. This is much larger than even many of the highest priced, heaviest power cars are now using. The bearings are of Parsons white brass and the connecting rods are also of Parsons white brass, die case. The fly wheel is extra heavy, insuring perfectly smooth running. The transmission is another superior feature of the 1911 model. The gears are made of special nickel steel, as are also the shafts from which they are operated. The clutch is the thermoid-faced cone type, smooth and positive.

Special attention is called in the catalogue to the fact that the drive from engine to rear axle is practically horizontal, giving a maximum of strength and power.

The brakes are the ordinary expanding and contracting type. The external contracting service brakes are operated by pedal and the internal emergency brakes by the outside hand lever at the right of the driver. The brakes act quickly on both rear wheels and the shoes are lined with thermoid, of large bearing surface.

The carburetor is of the float feed type. The ignition is of the jump spark system, with magneto. Easily adjusted worm and sector steering gear is used, both made of a special steel permitting very little wear and easily taken up by a large adjusting nut in the housing. This gear is positively irreversible. The steering shaft is set at a very comfortable angle and equipped with an 18-inch wheel. A spark and carburetor lever are placed at the top of the steering wheel on a ratchet segment.

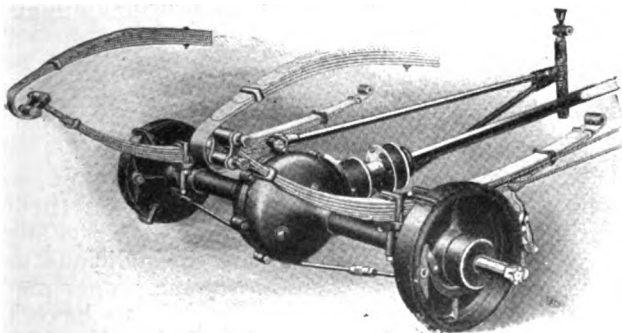
The frame is pressed steel and hot riveted with a sub-frame having $3\frac{1}{2}$ inch drop to which the motor and



The Schacht Motor.

transmission are suspended. All brackets and hangers are drop forgings or steel castings, and the frame is extra heavy and well braced. It has a kick-up in the rear and is narrowed in front for short turning.

The Schacht bodies are all metal and of exceptionally large and roomy build. Though the touring bodies are only equipped for five passengers, there is plenty of room for two additional chairs in the tonneau, making the Schacht in reality a seven-seated car. Special at-



The Schacht Rear Axle Housing.

tention is called to the fact that fifteen coats of paint and varnish are put on all bodies, giving them a finish second to none. This finish may be had in any desirable color.

The wheels are the artillery type, second growth hickory, 34 inches, containing 12 spokes both front and rear. They are equipped with quick detachable rims.

All cars are completely equipped excepting top and wind-shield, and this means two large gas headlights, two side oil lamps, and oil tail lamp, large brass horn, magneto, and full equipment of tools, pump, jack and tire repair outfit.

POOR HILL CLIMBING.

It Is Often the Result of Lack of Gasoline in the Tank.

An engine may have done exceedingly well on the level and up moderate slopes—more than sufficiently well to show that the engine was a good one and full of life—and yet when a hill has been met which is steep enough to demand a lower gear, the power has fallen away in an extraordinary manner. Naturally, the first explanation which presents itself is either inefficient transmission or incorrect gear ratios. However, either of these is not always the correct explanation. In many cases the deficiency is simply due to shortness of gasoline. It does not seem to be realized by many that an engine which is being “starved” of gasoline does not commence to “pop” back into the carburetor unless the supply becomes so small that the mixture will not fire. There are intermediate stages between a full supply and one which is so much restricted that the car utterly fails to climb a hill for lack of fuel, and many a car which never pops back or misses on a hill is, nevertheless, not getting a sufficient supply of gasoline to enable it to give off full power. This is often due to the tank being at too nearly the level of the float chamber on a gravity fed carburetor and to insufficient air or exhaust pressure in pressure fed systems. There are also such things as sluggish or binding floats which rub on the needle valve stem or on the sides of the float chamber when it is out of the vertical, as it is when on a steep hill. A less common defect is one of design, when, as sometimes occurs, the float is placed some distance behind the jet, so that on a steep incline the jet is too much above the float chamber gasoline level to feed properly.

It should be borne in mind that when a car is climbing on a low gear the engine is running fast and often at full throttle, so that the demand for gasoline is greater than it is at any other time except when running at full speed on the level. On the level there is plenty of gasoline, because the car is not “tipped up” as it is on a steep incline. In cars which have the tank under the front seat the tank outlet is only a little above the level of the carburetor float chamber, and it is obvious that as soon as the car is climbing a hill the float may be only getting a trickle of gasoline instead of its full supply, so that when the demand is greatest the supply is least, and yet it may never be so little as to stop the engine altogether. At the same time it is quite apparent that if the engine be starved by this partial failure of the gasoline supply loss of power is caused just when it is most required, and it is the secret of much bad climbing on the part of cars which do well up to a certain point and then die away most disappointingly when really severe collar work has to be faced. No hard and fast rule can be laid down, but if a man knows his car well both in mechanical detail and performance he can form a very good idea of how it should behave under different conditions. For instance, he knows, or should know, all the gear ratios, as well as the speed at which the car will run on the level, and if it will run fast, and accelerate with ease, and is full of life on the level but disappointing on steep hills, he may be convinced that this is probably due either to his gears being too high or to a restricted gasoline feed.

With gravity fed carburetors the simplest way to experiment is to note the speed up some particular hill first with a full tank and then with a tank nearly empty. It is also easy to measure the distance from

the float chamber to the gasoline tank as well as the differences in level. Without going into the niceties of calculation it will be obvious that if a tank be two feet from the float chamber and the "head" of the gasoline in the tank four inches higher than the float, a hill of 1 in 6 will practically stop the flow of gasoline. Even in cases where the head of gasoline is better than this if the tank be nearly empty there is undoubtedly some starvation, and quite the simplest cure is to solder up the air vent in the gasoline filler plug and to fit a hand air pump. The pump should be placed at a convenient position by the side of the driver, and an occasional stroke will keep a slight pressure of air upon the gasoline so that it will always flow readily into the float chamber.

In pressure fed systems there is not usually much doubt as to the condition of the system. The air pumps worked from the engine or gearshaft are now so common that many of the old troubles from exhaust pressure have been abolished, but even these air pumps occasionally get dirty and require cleansing or adjusting, or both, according to their construction. As a rule any pressure over 2 lbs. to the square inch is unnecessary and tends rather to waste. Where the pressure is maintained by exhaust the back pressure valve and filter should be cleansed periodically, as well as the by-pass pipe from the exhaust, for all these are apt to get dirty, especially if the engine have an exhaust which is at all foul. Whether the pressure be by air pump from the engine or by exhaust there is, of course, always the hand pump to fall back on. The ideal arrangement, all things considered, is the dashboard tank, as this gives the simplicity of gravity feed with the advantages of pressure feed. That is to say, the tank is out of the way, and, at the same time, there is always a good head of gasoline on the float.

WORTH READING.

Points on Repair, Care, Speed, Neglect, and Cost of the Car.

Run the repair shop with competent help; it is extremely difficult to conceal the shells.

Look after the insurance policy of your automobile just before you send it to a repair shop; places like that do burn down.

Do not run a repair shop without having everything properly insured; you may have to fix the place up a little before the insurance people will take the risk; why not do so?

Avoid handling gasoline in the garage just as if it were a fire extinguisher; the regulations for the safe handling of this liquid are fairly good—it is cheaper to follow them.

If you roll your car out of the garage at a racing speed you might run over your nearest relative, or the man who is on his way to make you his heir.

If you smoke cigarettes, why endanger other people by lighting them in a garage, or near a can of gasoline?

Don't clean the garage floor if you have money in the tire business; the way to increase the demand for tires is to soak them in lubricating oil.

Attend to your own affairs. If you want to have them mismanaged, just leave them to your help.

If you want a large tire bill to pay; old style clincher rims are at a premium on inactivity, and so the cost goes up.

Don't ramble; it is more enjoyable to map out an itinerary; be sure and include some historical place that will make it an object to travel; something to look forward to.

There is little enjoyment in a ride of more than 100 miles in 10 hours.

Don't take any man's dust; all that you have to do to avoid it is to allow him to speed on. True, you will be left in the lurch; it is a rather nice place; beats a hospital.

The story that insurance statistics tell is that high-speed automobiles have proven to be inferior insurance risks.

A poorly made automobile will outlast a high-priced creation if the latter is driven at a high speed all the time.

Good average speed is superior to good level road performing; miles per day should be considered rather than miles per minute.

Adjusting Engine Bearings.

Every part of the crank case should be well cleaned with kerosene forced through any oil leads or passages cast in it; gauzes, filters, and oil pump cleaned and dried, and then an examination made for wear. Begin with the main bearings; set up the crankshaft in them, and see if there be any side shake—a very small amount of end play is not really objectionable. If there be much shake it must be attended to, and if the bearings be lined with white metal they may need re-lining, for which work a blow pipe and lathe are necessary. If the crankshaft be on ball bearings, new races may be required. Bearings are "taken up" by filing the halves so that they come closer together, and then scraping the inside till the shaft takes a good bearing all around. As the shaft is then smaller than the bed it rests in, a piece of very thin foil or other packing is placed in the bed and cap in order that the bearing may be gripped firmly. In the case of a big end, the rod and cap, as well as the brass, are usually filed; packing is not good practice here, as it is liable to shift and be battered to pieces under the continual hammering of the explosions.

Put thus, in non-technical language, taking up a bearing sounds a rather simple matter, but in practice it demands skill and experience. The amateur will probably find it advisable to call in the services of a trained mechanic for this work, but if he do it himself he should read all he can find on this subject, and not be discouraged when he finds his bearings apparently getting worse instead of better towards the close of the scraping, for there is frequently a short period when appearances are very misleading.

Oval Crank Pins.

Connecting rods tend to wear oval, and they, consequently, are more trouble to take up than the main bearings. If the crank pins are only very slightly worn they may be dealt with by the judicious use of a smooth file and emery cloth. But the proper method, especially of there be much wear, is to have them ground in a special crankshaft grinding machine by some large firm making a feature of the work. Not one garage in fifty possesses such a tool; if there be a grinder at all it is neither large enough nor heavy enough to take a crankshaft of more than very moderate dimensions, and there are difficulties in chucking for the crank pins. The lathe presents the same chucking difficulties, and is a poor substitute for the grinder. If the crankshaft be sent away to have the pins ground it will be advisable to send the connecting rods and brasses also, in order that the latter may be re-lined or renewed if necessary, and properly fitted to their pins by the firm's experts. If the big-end brasses can be satisfactorily taken up, a rather con-

siderable amount of end play—for which there is no remedy short of renewing, or possibly re-lining—need cause no great anxiety, unless the car is to have a great deal of heavy work with no prospect of another overhaul for some time to come.

Renewing Ignition Batteries.

Many ignition batteries are consigned to the scrap heap as done for, when they could be made as good as new for much less than the cost of buying fresh ones to replace them. Terminals when broken off, and cases that leak, are quite an everyday job for anyone dabbling in electrical work; but when the plates have "shorted," by the paste falling out of the grids and lying across the positive and negative, or by its lying in a powder at the bottom at a sufficient height to touch the ends of the plates, the repair is more serious. In many cases, if the shedding of paste is not very bad, the pieces or powder can be picked or swilled out; but if, on examination, the remaining paste in the grids shows signs of loosening, or should the plates themselves be buckled, it is more than usual for repairers to say the job is beyond them.

Anyway, it is quite a general idea that it costs nearly as much to fit new plates as it does to purchase fresh batteries, and so it would if it were necessary to renew all the plates. But since it happens in nine cases out of ten that it is merely the positive plates which have gone wrong, and since, further, there are always less positive plates than negatives (in a cell with three plates two are negatives, 50 per cent. therefore in excess of the positives), it stands to reason that it should not cost nearly as much to replace the latter as it would do to buy new cells complete. Lest there be any who have not learned to distinguish a negative from a positive plate, it may be added that the former is of slate gray color, and the latter should be a rich chocolate.

Vulcanizing a Tire.

To vulcanize a tire, first remove the rubber from the outside of the tire for a space of one-half to one inch either side of the hole lengthwise of the tire and two to three inches of the way around the cross-section of the same, using either an emery wheel or coarse file, but do not injure the fabric. Next clean the inner surface of the tire with benzine or gasoline, and clean it thoroughly.

All soapstone, talc and rubber cement must be removed from the side of the tire, or the final result will be a failure. Now cover the inner surface where it is to come in contact with the patch with vulcanizing cement, at the same time cementing the outside where the rubber has been removed, being careful to have the edges of the old rubber thoroughly covered. Hang the tire up and let the cement dry for from one-half to one hour, according to the thickness of the cement used and the dryness of the atmosphere in which the tire is to hang.

Next take a piece of friction cloth, nearly as large as the place from which the rubber has been removed, and place it on the inside, then place a piece of the same size on the outside and roll them both down hard. Now give the outside a second coat of vulcanizing cement, let it dry a few minutes and then cover the entire space with rubber and roll it down firmly.

Trim the exposed edges so that they will make a good union with the old rubber, and roll the edges down hard. The tire should now be sprinkled with talc and placed in the sectional vulcanizer. This

should be done at 265 degrees of heat, and with ordinary tires a cure of about an hour is sufficient. The user of the vulcanizer will have to be governed to a certain extent by his own experience in this line of work.

Noise and Uneven Wear of Chains.

The side chain drive car has become unpopular with the pleasure vehicle public, not on account of inefficiency or durability, but because chains are more or less noisy. A number of manufacturers have reluctantly given up this type simply to satisfy the purchasing public in this one respect. There is a certain amount of wear in the bearings of each link, and this wear, when totalled for the whole chain, is considerable. When it is found that one chain has worn more than the other, it will necessarily be looser than the other, otherwise the rear axle could not be in line with the countershaft.

In lengthening or shortening the radius rods in the chain adjustment care must be taken to line up accurately the rear axle. In other words, the rear axle must be parallel to the countershaft, even though one chain may be looser than the other. If this is not done the rear wheels will be constantly travelling out of line.

Wear of a Magneto.

Wear in a magneto is to be looked for chiefly in the contact breaker, as the springs may have lost their "set." Resistance will be found wherever dirt or oil or grease exist within the magneto, particularly beneath small screwed-on parts, such as insulating washers or along shafts, or beneath brushes, and also wherever a carbon brush has been allowed to wear hard and scaly on the tip. Demagnetization of the horseshoes should never occur under two or three years of runnings. This job, in any case, entails the dismounting of the entire magneto, and whoever does the work must not forget to lay a piece of iron—a couple of wrenches will serve—across the horseshoes if they are detached first, or between them if the armature is taken out before the horseshoes are dismounted. On the whole it is probably advisable to return the machine to the makers in all cases of general debility.

New Road Surface.

The good roads experiment station of the United States Department of Agriculture has long been looking for a waterproof concrete for road making. It now appears that they have succeeded in making such a concrete by the simple process of adding about 10 per cent. as much crude oil as there is cement in the mixture. This oil-concrete is actually waterproof and just as strong as the oilless product. The oiled concrete costs about seventy cents more per cubic yard than the non-waterproofed variety. From six to seven cents per gallon is paid for the oil.

Careless Use of Batteries.

A man brought his battery back to the maker and demanded that he make his guarantee good, as the battery would not hold a charge. It was noticed that something was leaking from the bottom of the box. This was caused by the jar being cracked. It would not naturally hold the electrolyte. The man had evidently dropped the box or set it down too hard. Of course, he denied this and said he had not even been in an accident. He insisted that it must have been done by overcharging. This, however, could not be as an overcharge would crack the sealing compound on the top as this is the point of least resistance. The man purchased a new battery.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

REMODELING A LOCOMOBILE.

An Apparent Wide Divergence of Opinion but It May not Be as Conflicting as It Seems.

Two replies have been received in answer to Mr. Berg's query as to the advisability of remodeling a Locomobile steamer. In truth it must be stated that we have the utmost confidence in the judgment and candor of both the gentlemen. The conflict of opinion is quite likely due more to the point of view than to an error of opinion of either. If one's time is not worth much and he has a penchant for such work, quite likely he might not be sorry if he attempted to make the alterations as suggested by Mr. Wight. But the reader from Indiana is likewise a practical man, and his view should not be cast aside. Mr. Berg must be guided by his own feelings and opinion. If he goes ahead and makes the proposed alterations, we trust he may not be disappointed in the result, but we should not like to advise it. The two varying views follow:

From J. Harris Wight, Massachusetts.—In answer to Louis Berg, about building over an old model Locomobile, I wish to say I have done this on several cars and they all were improved by it.

Building the boiler in front will not condense any more than if under the seat. It will work just the same. Make the reaches longer by cutting them in the middle, and fit a steel tube in between them, and drive another smaller tube in them all. Then pin them tight. Have two spring lugs made same as on rear, for the front side springs. Maybe J. L. Lucas, 2 Fox street, Bridgeport, Conn., might have some of these lugs on hand and they can be got cheap if he has. They can be made by any good blacksmith. Then take $1\frac{1}{4}$ inch angle iron and run it along the side of the car and out in front as long as the frame is to be. Fit a square made out of this angle iron with the L up so the boiler will fit right inside nicely. Take the steering rod and have it made longer to match the reaches. It is a very simple matter to rebuild these cars if one is handy at such work and one can enjoy the pleasure he gets from it. I have a friend who just built one over and he got a fine delivery wagon out of it and made a very pretty car in shape and handy in his work.

If he cares to write me I can tell him how he can make a pilot on his burner, if he has a good burner. Give me the make of burner and style. If the burner is in bad shape and pretty well burned out I would not advise spending any money on it but he had better buy an oil burner. I have used nothing but oil on my steamers for several years, but one must understand the burning of oil. It is simple enough if you once get onto it. Turn the boiler upside down and it will steam like new. The bottom no doubt is now well scaled up. Simply plug the hole not needed and tap out a hole for its bottom. This will pay well to do. In fitting the burner on the boiler in front be sure to have the mixing tube face front. This will give better draft and work much nicer and is handy to get at.

Bring your water glass out the side of the hood so it faces the driver, and have it on the side of the boiler at

the middle, so to have the water level. Do not place it back of the boiler. It will not be satisfactory. It will no doubt take more power as he will add some weight to the car, but nothing of consequence. Be sure to put a set of springs on the front same as the rear, as one will not hold it up and will not work satisfactorily. Then be sure to put a truss rod from the rear springs to the rear of the front springs. This must be done anyway or the car will sag in a short time.

[Note.—Mr. Wight's address is Northampton, Mass.—Editor.]

From W. E. M., Indiana.—In looking over last month's magazine, on page 71 is an item from Louis Berg, Maryland, asking something about remodeling a Locomobile steamer—making the car longer and putting the boiler under the hood in front. Now I will state for his benefit, I have one about the same as he wishes in my garage. It has been here ever since it was overhauled, for two years. The boiler is under the hood and the wheel base has been lengthened to 100 inches, the frame spliced and got up real nice, so to speak. But it never ran afterwards, and is lying here at an expense of about \$150 besides the work. There were three of these small Locomobiles in this city, and two of them were overhauled and one of them run some, but it has been in the owner's barn for the past two years. So you see there is nothing in it. You had better junk your car and take the amount you would spend for the remodeling and use it for firecrackers for the Fourth. I junked three of these boilers and about that many burners. They were not worth the time of trying to fix them. Don't go to any expense on a trap like that. You might even better take your money and buy beer.

Demand for Steam Cars.

Gasoline cars have gone practically every place that it is possible for an automobile to go, still in those parts of the country where hills, sand and mud demand the maximum power and flexibility there is no power in the world that is more efficient than steam.

A steam car is considerably more simple than a gasoline car. There is no explosion at the head of the cylinder, but, in its place, a cushioned elastic force which acts on the piston during its entire stroke. There is no reaction on springs to overcome. Then, instead of four oscillations to one impulse at the head of the cylinder, the steam engine is so perfected that the steam pushes the cylinder down and then pushes it back. It is an elastic, positive, even power from which there is practically no reaction.

By adding another cylinder on a quartered crank the position known as dead center is entirely eliminated. Further there is no cranking to a steam engine. One simply turns on the steam, which, in the White steamer, is accomplished by a throttle wheel affixed within the steering wheel. It is not necessary to disconnect the engine from the vehicle, as no initial impulse or cranking is needed.

The fact that it is unnecessary that a steam engine be running at normal speed before the load is applied has entirely eliminated clutch problems. Then, too, the whole subject of transmission and shift gears can be neglected because the only operation necessary to obtain higher speed is to open the throttle. The fact that speed is entirely controlled by the throttle secures such results that no car in the world is so flexible and so quickly adapted to every possible road condition.

The invention of the flash boiler and later its adaptation known as the White generator, has probably done more to make practical the use of steam in automobiles than any other invention. Steam auto-

mobiles have their place. Where it is almost impossible for any other car to go one may expect to find a steamer.

Good Points in Both Steam and Gasoline Cars.

From C. G. G., New York:—R. S. D. Iowa's letter in the April number hits the nail on the head. You have always to do your own repairs, as no one else understands a thing about them. However, this very fact makes it much cheaper. I have had a Stanley B, H 4, two Fs and have just bought a 70. One of my uncles has had a Gardner-Serpollet and a White. This new 70 is the best of the whole lot and I believe will last much longer, as upon a recent visit to the factory I found by personal breakage tests in the press, that they are using a much tougher grade of steel than was formerly the case. I find the Stanley is the car I use when I have the chauffeur, as I like riding in it best, but when I am alone I use my National 40, as it starts so much more easily. We used to use a Stanley for town work too, but found that the plug blew out too often when standing long in cold weather, so we bought a Lozier little six. So you see I have had quite a fair experience with both kinds. I have burnt out boilers, but I have also broken crank shafts, which is more expensive. I took a Stanley to Europe in 1908, but had considerable trouble with the infrequent and hard water in France. I plugged up the boiler feed and burst the indicator once with lime in the elbow at the boiler top. Stanley was all right in the only part I tried, the valley of the Po, however. Switzerland has roads not suited to motors, and the police are very strict, so much so that I was arrested and fined \$100 for not *giving up* a permit to cross the Simplon at the farther end. They try to "soak" you there. England was fine (we had good weather in October!) Taken all in all, I should not repeat the trip with a steamer, as when you have to fire it up yourself in some dirty inn yard it is disagreeable, besides which the roads are flat and straight, the ideal for gas cars. But for touring here in America, with its hills and bad roads, there is nothing like a steamer, especially up in the Berkshires, where we live in the summer.

That Whistling Sound.

From J. Harris Wight, Massachusetts.—In answer to W. B. P., Vermont, the whistling is caused by heavy fire and facing the wind running at a rapid rate. This causes a heavy force to enter the small mixing tubes and it will whistle at times and cannot be stopped. This make of burner is noted for its whistling, although it is hard to find one that does not at times if it is on front. Sometimes if the nozzles are set out one-half inch more will stop it. As a rule there is a point these can be set that will stop it if one can find it. Sometimes the noise can be stopped by filling in the burner between the rows of slots with asbestos. But carrying such high air pressure as these cars do it is a pretty hard thing to overcome it altogether. He says the colder the air the louder the whistling. This means it is a heavy fire, as light fire will not whistle as a rule. The whistling in the burner is at the mixing tubes. A perfect combustion will not whistle. Too much air will whistle badly.

As to his automatic regulator for the fire, I do not just understand his meaning. If I did I could help him out. It looks to me as if he had ground the end of the needle so it is too short. In this case he must send to the factory for a new needle stem. The needle rod should not spring but come tight to the seat and open

automatically on about ten pounds. They can be adjusted closer but it is hard to keep them there.

About hooking up his car, I would not advise any more hooking up. He can do it if he wants to, and it will work nicely on some of the new cars, but I think he will find he is now running on expanding steam some. If he is not it will pay. I had a car once that would not steam any too good and if I hooked it up a quarter way would run off fine and take a hill much better. It saves lots of steam surely, and this helps out the boiler. The cost would be hardly anything if he did the work himself. Hooking up a railroad engine and a small auto engine are two different things. Auto engine cylinders are small and run very rapidly. If his car runs nicely I would advise not to do it. The fewer things on a car the better it is to take care of and run.

Steam Car Trouble.

From J. T. Ostrus, Iowa:—In reply to Charles Conro, of Wisconsin, in regard to his White steamer, I have had some trouble, too. It is caused mostly by a leak in the vaporizer or the pilot light. Also the nozzle holes wearing large. The main trouble I have had is the asbestos packing wearing out around the burner. Write the White Company for one of their diagnosis charts and you will find an answer to most any steam trouble.

I have used sulphuric acid to clean the generator with. I used about one-fifth acid and the rest water, and left it in about 24 hours. Close the throttle tight. You can kill the effect of the acid with a pound of baking soda to a pail of water pumped through the generator and then wash thoroughly with water.

From Subscriber, California:—I was asked for information concerning the re-treading of old casings and how the work was done recently and was unable to explain. I want to cement a layer of fabric on the inside of my casings to strengthen them and cover the breaks which have been caused from frequent punctures, I cannot get the fabric to lay smooth; it wrinkles.

Cost to Repaint a Car.

The average paint shop does not have data on the price to charge for repainting and varnishing automobiles. As this is a new line of work the profit has not yet been cut, as was the custom on carriage and wagon work.

The following list of prices represent the cost of work as charged by many automobile painters:

Revarnishing Limousines	\$65.00
Painting and Varnishing Limousines	100.00
Burning off, Scraping and Painting up Limousines	125.00
Revarnishing Touring Cars	45.00
Painting and Varnishing Touring Cars	75.00
Burning off, Scraping and Painting up Touring Cars	100.00
Revarnishing Runabout Cars	25.00
Painting and Varnishing Runabout Cars	45.00
Burning off, Scraping and Painting up Runabout Cars ..	65.00

Bound Volumes.

We have received several inquiries for bound volumes of The Automobile Dealer and Repairer for the year 1910.

We can furnish a limited number of these, substantially bound in heavy boards, leather backs and corners at \$4.00 each.

Cover rust with grease and let it remain for a good period. Then moisten a cloth in ammonia and rub the surface. This will remove rust in most cases. If spots remain rub them with a weak hydrochloric acid solution. Wash all the acid off with water and rub dry.

VALVE GRINDING.

Unique Type of Machine in Use at the Inter-State Automobile Plant.

From R. W. Hutchinson, Jr., Indiana.—One of the most exacting operations in the building of a first-class automobile motor is the correct fitting of the poppet valves, as it is upon this detail that the compression, and the power derived from the motor depend. Several methods have been employed with varying success, but it is generally conceded that grinding or wearing in the valve upon the seat is most satisfactory. This operation has almost invariably been performed by workmen with hand-operated tools, for it was considered impossible to duplicate the peculiar motion necessary for perfect results by any automatically operated mechanical device. The personal equation entered into this method, however, and the inaccuracies which naturally follow made the results uncertain at all times. It was found impossible for the workman to hold the tool in such a position that unequal wear did not occur on one side or the other of the valve seat, owing to the bending of the valve stem. Fatigue, due to the incessant motion was also a serious factor, and the workman was inclined to neglect the finishing of the valve and valve seat. This resulted in imperfectly fitted valves, which required constant attention and frequent regrinding, and which approached perfection only after many months of service.

Many attempts were made to design a machine which would satisfactorily perform this labor, but it remained for Mr. J. F. Higbee of Muncie, Ind., engineer and expert in machine design, to solve the problem. Mr. Higbee designed and patented a machine which has been in use at the factory of the Inter-State Automobile Company at Muncie, for twelve months, and has given universal satisfaction since its installation. It grinds, with absolute accuracy, a complete set, or eight valves simultaneously, the time required varying between ten to twelve minutes for a completely finished set. The old hand-grinding operation required from thirty to forty-five minutes to each valve, and in view of the fact there were many valves imperfectly fitted, this average is very conservative.

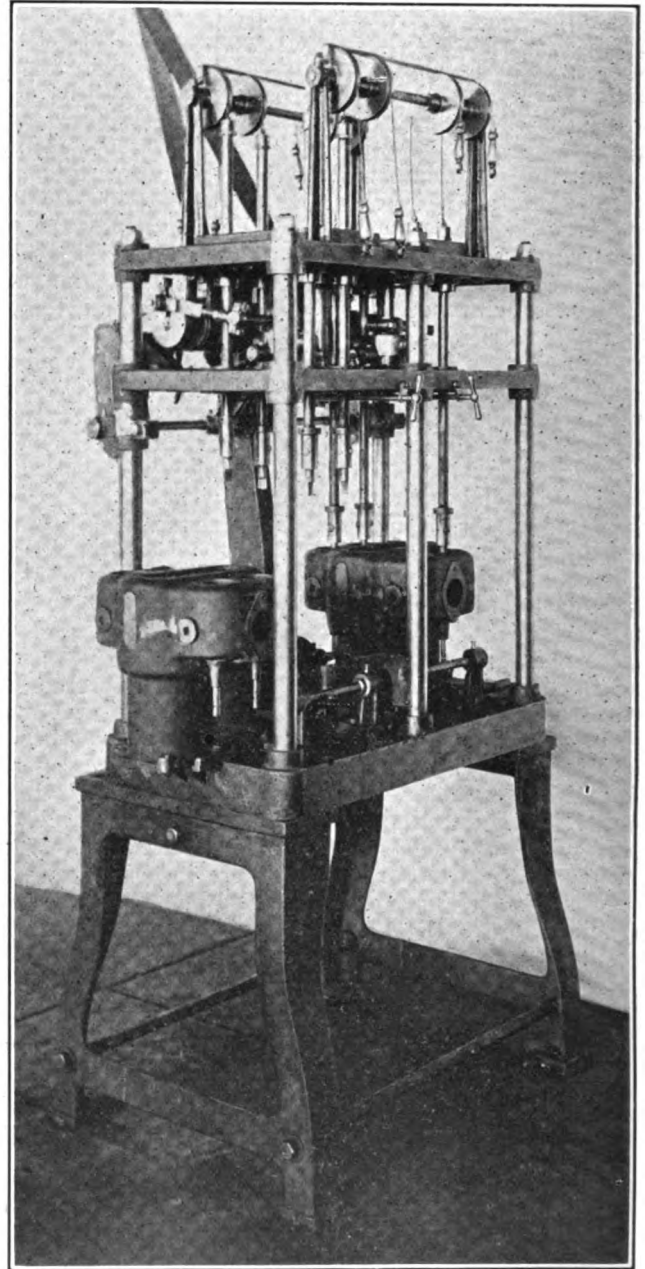
Before adopting the machine, the Inter-State Company kept a careful and accurate record of the old hand-grinding process and found that the average number of valves ground by each workman in a working day of ten hours was one and one-half sets, or twelve. With the machine here illustrated, forty sets, or three hundred and twenty valves, have been ground in ten hours, and the attention of one man only was required. The operator also tested each valve to determine whether it was perfectly fitted.

The saving in time accredited to the use of the machine was enormous. It has been estimated that the one machine, in the twelve months of its operation effected a total saving of \$5,000 or \$2 to each machine. This does not take into consideration the time which would have been required to regrind valves fitted by the old hand process, and does not show the satisfactory operation of the valves ground by the machine.

The basic idea of the machine is to reproduce the progressive reciprocating motion of the valve as is done in correct hand grinding, and to preserve the proper position of the valve-operating spindle. The motion is produced by a ratchet and pawl combination, the four spindles required for turning the valve in each pair of cylinders being operated simultaneously. The illustration shows one pair of the cylinders of the 50 h.p. Inter-State motor in position, with the spindles in the driving position on the valves, and one pair partially removed,

showing the ease with which the cylinders may be interchanged.

The spindles are set over the exact centers of the valves and so transmit no side thrust to the stem. They may be raised singly to inspect any valve without suspending the action of the other seven valves, or the four spindles required for each pair of cylinders may be stopped and raised to permit of changing the cylinder with-



For Valve Grinding.

out stopping the other four spindles. The lower end of each spindle is provided with a self-centering bit which readily engages with the slots on the upper side of the valve head. Should these bits become worn, they may be very easily removed and new ones substituted.

The valves are raised from the seats at regular intervals by cams upon a shaft which is located just under the ends of the valve stems. This permits the grinding element to work down under the surfaces which are being ground, and make it unnecessary to stop the machine to perform this function.

The Inter-State Automobile Company is at present the only manufacturer in the world using Mr. Higbee's

machine. With it all of the valves on Inter-State motors are ground, and their satisfactory operation emphasizes the efficiency of the method. The adoption of the machine by this company is indicative of the care which is exercised to perfect Inter-State motors without adding to the cost of the car, and to produce a machine which will successfully withstand the wear of active road service.

Not Ammonia Spirit But Common Ammonia.

From F. M. Beckford, New Hampshire.—In your last issue you published a letter which I wrote you relating to the extinguishment of gasoline fires by ammonia. Inadvertently I used the words, spirits of ammonia, which I find upon investigation to be wrong and in fact, might be attended with some danger. The ammonia to be used for the extinguishment of gasoline fire is aqua (water) ammonia, what we generally call common ammonia. I trust you will give this publicity, and see that it is corrected in such a way that it will reach your readers, and I sincerely hope that no one has tried or had occasion to use the fire extinguisher which I recommended in the former issue.

Taking Down Piston and Rings.

First remove the securing screw or ring which holds the piston pin in position, then gently tap out the pin with a piece of soft copper or hard wood. An extra hand

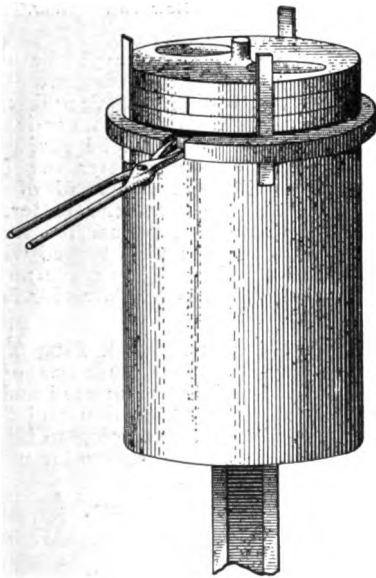


Fig. 1.

is required to hold the piston while this is being done. Now, having the piston free, the next thing is to remove the rings. This may be a troublesome job, but if rightly tackled is very easy. Figs. 1 and 2 show the first and second operations of removing the last ring, which is the most difficult when it has to be slipped over the grooves from which the other rings have been removed. The tools required are three strips of thin tin, $\frac{1}{4}$ or $\frac{3}{8}$

inch wide, and of a length proportionately as shown; a pair of tongs made of $\frac{1}{4}$ inch diameter steel wire, tied up with copper wire to form a hinge, so that the end away from the hand opens instead of shuts when the tongs are gripped (just the opposite to ordinary pliers); and a pair of hands. Commence by opening out the rings slightly as shown in Fig. 1, insert a piece of tin

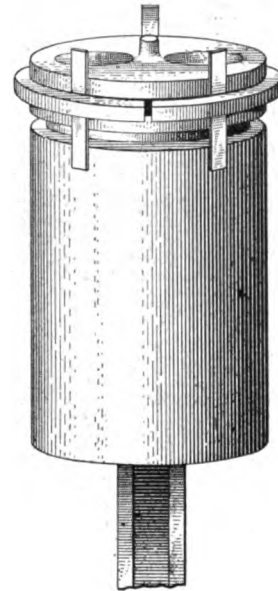


Fig. 2.

between the ring and the piston, loose the tongs, and then take hold of the tin above and below the ring, and slide the tin round to the opposite side of the slit. Next insert another piece of tin in the same manner, and also a third, leaving them in the position as shown by Fig. 1. Now take hold of the ring as shown by Fig. 2, pressing with the thumbs on the top of the piston, and the ring will slide easily off. With this method the fingers are not cut or pinched, the ring is not broken or distorted from its circular shape, and the time occupied is not a tithe of that required without this simple device.

Two Types of Worm Gears.

There are two types of worm in use on cars abroad, the double throated, or hour glass type, and the straight type, in which the worm wheel alone is throated. There is considerable discussion at the present time as to the merits of the respective types. Advocates of the double throated type claim that the land or bearing surface of the worm with the wheel is considerably higher than with the straight type and were it possible to pursue similar methods of manufacture in both cases there might be some advantage from this quality alone.

Don't try to stop your car in ten feet when you can just as well stop it in forty feet. Sudden hard application of the brakes is hard on them and harder on the car, its tires, and its occupants.

The "High-Quality-Sane Price" Car.—Readers who may be intending to purchase a new car will doubtless want to see the advertisement in this issue of the Inter-State Automobile Company, A. D. R. 5, Muncie, Ind. This company describes several interesting features about their cars and will send further particulars to any one who may be interested.

The threads of all bolts should be smeared with "Dixon's Motor Graphite" mixed in oil to a paste-like consistency.

This mixture should also be applied to the spark plug threads.

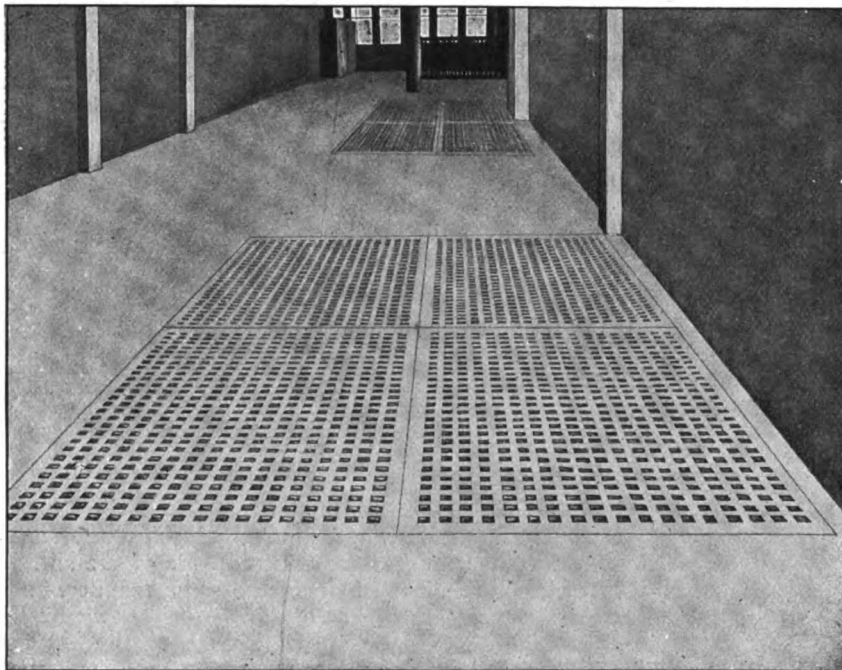
Bodies and Seats.—Our readers who may be interested in bodies or seats should write at once for the catalogue just brought out by the Grand Haven Auto Body Company of Grand Haven, Mich. They guarantee prompt deliveries. See their announcement on another page.

Radiator Repairing as a Specialty.—Undoubtedly many of our readers have trouble occasionally with leaking or

broken radiators. These can be speedily and satisfactorily repaired if you will send them on to the Livingston Radiator and Manufacturing Company, Inc., 139 West 52d street, New York City. They would also like to communicate with our readers regarding the possible replacement of old radiators with their famous patented Livingston radiators. Write for estimates on your repair work, and for any other information, to the company above named, not forgetting to mention this magazine.

Garage Construction.

Not a great many years ago, when the automobile industry was in its infancy, it was the custom to erect garages of light construction. They were hardly more than temporary structures and the least amount of money possible was expended. As autos grew in popularity and became necessities in commercial pursuits, auto companies and private individuals and companies underwent a transformation. No better illustration of this is contained anywhere than in the recently completed garage buildings erected by the Globe Realty Company of Indianapolis.



The main floor of the garage is used chiefly for the storage of automobiles. A strong cement floor was laid as a part of the plan to make the building thoroughly substantial.

In order to utilize all possible space the basement was constructed to serve as a workshop. For a time some difficulty was experienced in solving the problem of how to secure sufficient light for the basement. This obstacle was finally overcome by the use of a system of Raydiant Floor Lights, manufactured by the Berger Manufacturing Company of Canton, Ohio.

The lights were specified in the plans for the floor of the main story of the garage. They were installed in order to secure perfect light for the workmen in the repair and general workshop below. They were also installed in the sidewalk about the building, throwing additional outside light into the basement.

Rotary Rasps.

Removing the old tread of tires by ordinary methods is the most tedious and



A Rotary Rasp

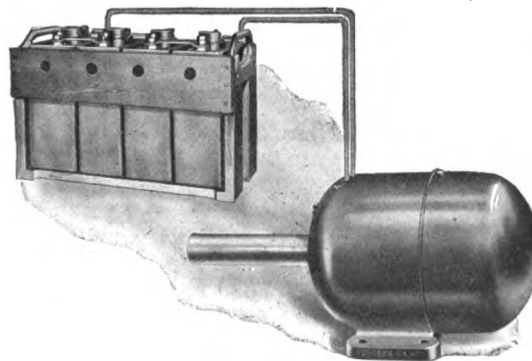
expensive part of retreading. Surprising results are obtained with the new rotary

rasps in this service. They quickly cut away the old tread and rough up the carcass ready for the next operation. An experienced operator with one of these rasps will often prepare a tire for the new tread in fifteen minutes' time. About two hours of strenuous hand work would otherwise be required. These rasps are most durable. They are mounted on the ordinary emery or buffing stand, the spindle of which should not be less than three-quarter inch diameter. Rotating speed should be from 1,500 to 1,800 R. P. M. In ordering be sure to mention size of arbor hole wanted, and address

The Williams Foundry & Machine Company, Akron, Ohio.

Electric Car Lighting.

Hitherto, electric lighting for automobiles has been more or less in the experimental stage. This is natural, for the problem has been one of unusual difficulty—far more so than that present-



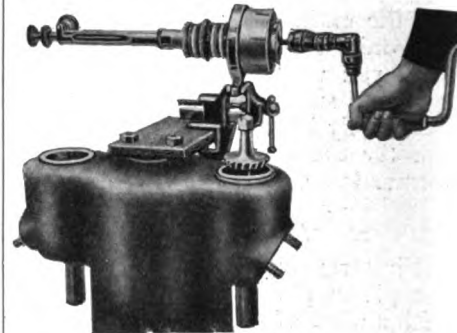
The Holtzer-Cabot Dynamo and Battery.

ed by the lighting of railroad trains. The automobile runs at all kinds of speeds. A system of lighting that would work well on a car running at twenty miles an hour might be useless on a car running at ten or thirty miles. The variations in train speeds are of course nothing like so great nor so abrupt. Further, the automobile is first and foremost a pleasure vehicle. No complicated devices will hold favor long. A lighting

system, to recommend itself, must have simplicity as well as efficiency. All the objectionable features enumerated above have been got rid of in the new Holtzer-Cabot system. This consists essentially of a dynamo and battery working in harmony. For full particulars address the manufacturers, the Holtzer & Cabot Electric Company, Brookline, Mass.

The Crone Valve Dresser and Reseater.

The illustration shows a valve truing and re-dressing tool made by Mr. F. G. Crone, 334-336 Genesee street, Buffalo, N. Y. A board was bolted on a cylinder and the valve dresser placed in a small vice clamped to the board. In operating the device the brass lug is placed in a vice horizontally. The ex-



A New Valve Seater.

panding shells controlling the adjustment of the valve stem should be adjusted by a light touch of the fingers. To seat the valve, an ordinary brace and screw driver-bit is used. In case there is no slot in the valves a Y-shaped screw-driver bit may be employed after two holes have been drilled in the head of the valve. To seat the seat, the cutter, with the guide attached, is inserted in the valve head opening and is turned with a brace and bit. The tool is made up in several sizes. Address as above for further particulars.

Ignition and Spark Plug Talks.—The Jeffery-Dewitt Company, of Detroit, Mich., has just had printed and published a book called "Ignition and Spark Plug Talks," the object being to help automobile owners, and gas engine users in gen-

eral, to a better understanding of the fundamental principles behind successful ignition. Once you get a firm grasp on these principles many of the difficulties that have hitherto perplexed and annoyed you will disappear. This book concerns itself only with that information deemed of practical value to the average users of automobile and gas engines. A copy will be sent free to any of our readers by addressing the firm as above.

NO MATTER *FIX 'EM UP YOURSELF*

Make
One Tire
Outwear Three
with a
**NATIONAL STEAM
VULCANIZER**
Try it Free

MANUFACTURED BY
THE NATIONAL MOTOR SUP. CO.
1840 EUCLID AVE.
CLEVELAND, OHIO.

NATIONAL STEAM VULCANIZERS

are the most satisfactory for individual owners and small garages—and we will let YOU prove it yourself!

STEAM IS THE ONLY METHOD OF DOING FIRST CLASS VULCANIZING AND EVERY TIRE MANUFACTURER WILL TELL YOU THIS. We will bet dollars to doughnuts that if you have an electric or other DRY-HEATED vulcanizer, you burn the tire at least once out of every five jobs you do. Isn't that so? When using a "National" Steam Vulcanizer, you don't "tell when the job is done by smelling the rubber burn." The "National" is a hollow brass shell partly filled with water and never needs refilling. It is heated by an alcohol lamp with adjustable wick. You do not have to watch it after you get up steam, which only takes a few minutes. The heat control is PERFECT. Will vulcanize both tubes and casings of any size. Not necessary to remove casing from rim to vulcanize. CAN BE USED IN THE COUNTRY OR ANYWHERE. Only weighs four pounds, and is packed in small wooden box to carry in tool box. Why bother with the dopes that fill up the holes and then come out in a day or two? Get a "National" and vulcanize them, and then forget there was a hole. Nearly 15,000 satisfied users. Ask your neighbor, he probably has one. Better still, order one today and try it yourself on your own tires. Seeing is believing.

FREE OFFER

We will ship a complete outfit including all supplies and instructions by express on ten days' free trial. If it is just exactly what we claim for it, send us \$12, or return the vulcanizer to us. **WE** take all the risk, but **WE** know what it will do. Order today.

Manufactured by

The National Motor Supply Co.
1914 Euclid Avenue, Cleveland, O.

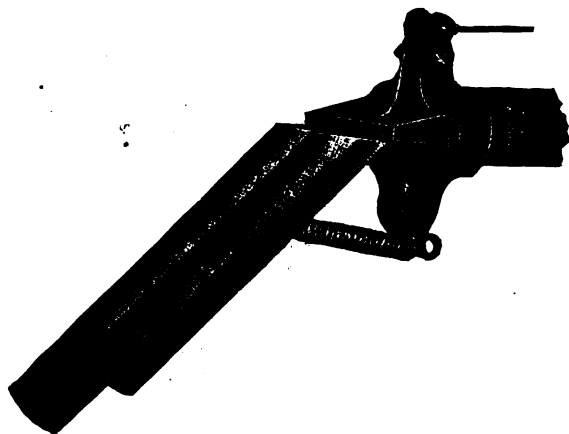
Please mention the Automobile Dealer and Repairer when writing to advertisers.

The Exo Warning Signal.

This is a new and highly recommended warning signal for automobiles, which is being placed on the market by the Troy Auto Specialty Company of Troy, N. Y. This signal operates through the exhaust of the engine and

respondence to Lovell-McConnell Manufacturing Company, Newark, N. J., and mention this magazine.

Stay Shiny.—This is the name of a preparation manufactured by F. H. Schmoeger of Sterling, Ill., to be applied to all brass parts to prevent tar-



The Exo Warning Signal. Manufactured by the Troy Auto Specialty Co., Troy, N. Y.

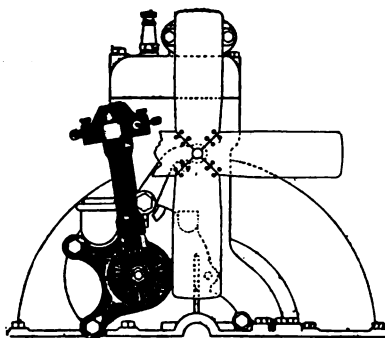
requires no expensive batteries, armatures or diaphragms. It is operated by a foot pedal placed on the toe board. It is always ready for service by simply depressing the foot pedal, thus causing the signal to raise and the exhaust to flow through the elongated chamber and across the two brass tubes, giving two distinct mellow notes in accord, which are rich and pleasing to the ear. Its operation is purely mechanical and its notes while powerful are not strident or harsh. The signal can be heard a mile away on country roads; or it can be toned down to meet the requirements of city traffic. The manufacturers state that the "Exo" is indestructible and will outlast all the cars you may buy in a lifetime. This signal is being put on the market at a very low price. For all styles of car above 30 h.p. the price is \$7.00, and for smaller cars, under the power named, the price is only \$5.00. Many of our readers will undoubtedly be interested in this signal at the very low prices named. Orders should be sent direct to the Troy Auto Specialty Company, Troy, N. Y., or if more convenient to the New York Office and Sales Rooms, 1976 Broadway, New York City. In sending in your order and inquiries mention this journal. A descriptive circular will be sent free on application.

The Conover Safe-Guard.—We wish to call the attention of every reader to the very attractive full-page announcement, which appears on our outside back cover this month. This announcement illustrates and describes the Conover Safeguard which is the very last word in bumpers. It is a handsome, massive solid bar, made in bronze or steel, as desired and altogether different from the ordinary pipe bumper. It is strongly supported by double semi-elliptic steel springs—not the small stiff spiral ones in common use. It is a positive protection and at the same time an ornament to any car. The Conover Safeguard will be shipped express paid anywhere in the United States on thirty days' trial, upon receipt of the regular price. For prices and complete description consult our back cover page. You are requested to send in your orders and inquiries promptly as the announcement may not appear again. Address all cor-

respondence to Lovell-McConnell Manufacturing Company, Newark, N. J., and mention this magazine.

The B. M. C. Vertical Timer Bracket.

This is a device especially adapted for use on the "Model T" Ford engine. Its object is to bring the timer up to a conveniently accessible position for cleaning and adjustment. It fits on the front crank-case cover, as shown in the illustration, the lower bevel gear slipping over the end of the cam-shaft, in place of the revolving center of timer, and the vertical shaft of the bracket fits in between the oil-filling hole and fan

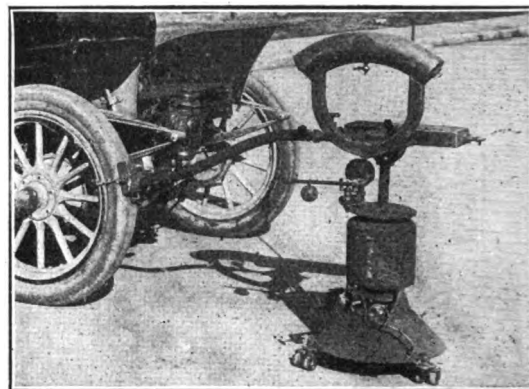


Front view of motor, showing method of attaching Timer Bracket to crank case.

bracket, so as to clear the fan blades, with ample margin. This device is easy to apply to the car, as there are no holes to drill and no alterations or fitting necessary. Hundreds of these brackets are already in use; and car owners state that they are a great convenience in the prevention of ignition troubles, as the owner is able to ascertain the condition of his timer instantly and to remedy the difficulty, if there is any. The bracket is sold at a reasonable price; and interested readers are requested to write for prices, illustrated circular and complete information, to the Brooklyn Machine Company, 963 Atlantic avenue, Brooklyn, N. Y. In your correspondence addressed to this company, please mention The Automobile Dealer and Repairer.

Innovation in Tire Repair Machinery.

A tire repair machine that has its range of action confined to a limited amount and type of tire repairing has long been desired by the host of garagemen, dealers and repairmen, who have felt the need of some tire repair equip-



Vulcanizer attached to a Car

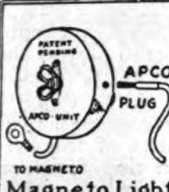
ment but have not wanted to enter the industry to such an extent that they would be compelled to hire an expert tire repairman and make a heavy investment for the plant and the material.

The Motor Appliance Company, 1303 Bellefontaine, Indianapolis, Ind., who make the M. A. C. vulcanizer have long realized that a repair outfit for a limited amount of tire repairing was much needed. As the average small town garage has not tire repair business enough to warrant making this a separate department, it is desirable for them to secure a plant that they can operate with their limited experience, and which will repair successfully the small blow-outs, minor cuts and fractures in casings, and will do all classes of inner tube work.

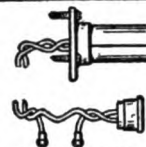
The principal points of superiority connected with the M. A. C. vulcanizer, shown in the illustration are the portability, compactness, efficiency of the steam boiler, and the large assortment of jobs that this plant will successfully handle. One of the most pleasing features is the portability of the outfit. It can be moved from place to place and even out into a drive or street where by means of the extension steam arm and extension hot plate, it can be attached to a tire while on the wheel. The inner cure mould is a decided innovation and comes as a welcome addition to any shop in this day of re-liners and inner re-enforcing strips. Every repair shop and garage should be in position to vulcanize in these re-liners in place of using the cold cement as is ordinarily furnished. This feature in addition to the curving of sections built up from the inside make the inner cure mould a very valuable one.

The plant is furnished by the manufacturers complete with small tools, and they also furnish material if this is desired. The price complete with all tools and parts is \$40 and this covers everything for the work and that of the best.

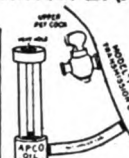
The Springfield Jacks, Tire Tools, Tire Pumps, Etc.—In this issue the Shawver Company of Springfield, Ohio, have an announcement with illustrations, of their different styles of jacks, ranging from \$1 to \$3, depending on the style. This company wants to send its dealers' price list to every dealer and repairman in the country. In writing for it please mention this paper. We understand they have some special rates to make.



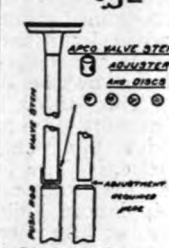
Magne to Lighting Outfit
\$5.00




Speedometer Light \$2.00



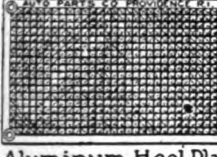
Oil Gauge \$1.50




Valve Stem Adjuster
\$1.50 Per Set



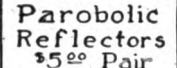
Whistle
\$3.50 Complete




Aluminum Heel Plate
\$1.00



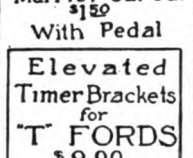
Valve Spring Covers
4.00 Per Set




Parabolic Reflectors
\$5.00 Pair



Muffler Cut-Out
\$1.50 With Pedal



Elevated Timer Brackets for "T" FORDS
\$8.00



Valve Spring Remover
\$1.00

FORD OWNERS
15
APCO Specialties
Ask Your Ford Agent He Knows
Catalog "N" FREE
Auto Parts Co
Providence, R.I.

Regrinding Cylinders.

If the cylinders be appreciably worn—that is, if a slight ridge or shoulder can be felt at the lowest point of the rings' travel—they need grinding. New rings can be put on, but as their slots must be filed sufficiently to permit their passage past the unworn part there will be too large a gap when the worn part is reached. If, however, the engine has satisfactory compression and there are no signs of rubbing on the piston the old rings may be put on again for a time, particularly if the owner is doing only such work as is absolutely necessary.

Cause of Overheating.

A 30 h.p. four-cylinder touring car once developed a stubborn case of overheating which puzzled the owner for several weeks. The pump was inspected and found in good order; the carburetor was readjusted and the fan belt tightened, but still the overheating persisted. Finally the cause was discovered in the gaskets between the water pipes and the cylinder castings, which had melted and spread until they nearly closed up the openings. A few minutes' work with a sharp knife settled the trouble for once and all.

For the Best Tire Results.


In five months the Diamond Tire Service Stations, which were placed in all the larger cities for the benefit of automobile and accessory dealers, have grown from 25 to 54. Dealers appreciate having supplies carried right at hand for them. Motorists, also, have been quick to realize the advantages in having trained tire men at their convenience to co-operate with them in getting best tire results. Stations may now be found not far away from most of our readers.

Mosler

Spit Fire

THE PLUG WITH THE DEEPEST CHAMBER

Made to fit any Engine any Thread



Magne to Type-Battery Type-Breecch-Block Type The plug with the handle

MOSLER
PAT. 4-22-02
PAT. 9-15-03

MOSLER
SPIT-FIRE
PATENTED

A. R. MOSLER & Co.
163 W 29TH ST. NEW YORK.

New Inner Tire.

The accompanying illustration is of an inner tire, which the Zimmerman Rubber Company are placing on the market. They claim that in making this tire they use only the very best material, and before each inner liner leaves the factory it is coated with a self-vulcanizing material, which causes it to adhere perfectly to the casing. They are also moulded to the exact shape of the inside of the casing and appear just as an outer casing would if it had no rubber on the outside and no clincher part to it. This concern also make a full line of outside lace boots, blow-out sleeves, tube repair kits, casings and tubes, raw materials for

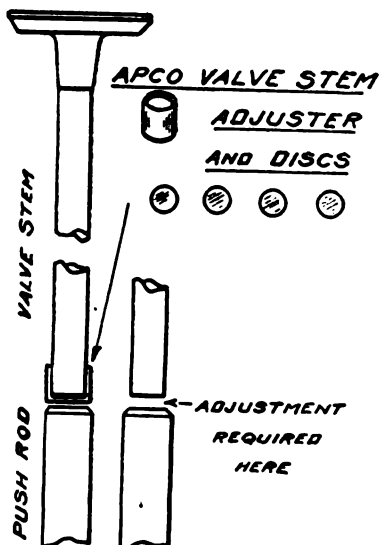


Zimmerman Inner Tubes.

repair work, also bicycle and motor-cycle tires, mechanical rubber goods, and a full line of repair vulcanizers, and kettle vulcanizers. They are making inducements to all, but special inducements to jobbers, dealers, and agents. By writing them and mentioning The Automobile Dealer and Repairer, they will send you full particulars. Address the Zimmerman Rubber Company, Alexandria, Ind.

Valve Stem Adjusters.

The Apco Valve Stem Adjuster is said to make your car run as quiet and



The Apco Valve Stem Adjuster.

smooth as an electric. There is a certain time for valves to open, and if they are late, even a fraction of a second, the

motor will lose power and become noisy. The Apco Adjusters can be put on your motor in half an hour and wear on the valves can be taken up at any time by simply putting a disc under each valve stem. Most high-priced cars have this adjustment and the manufacturers offer to put them on your car and if they are not all they say, return the set and they will gladly refund the purchase price. State diameter of valve stem or year and model of car when ordering. Address Auto Parts Company, Providence, R. I., and mention this journal.

The Allen Tyrometer.

This is a new tire pressure gauge which enables the car owner to secure

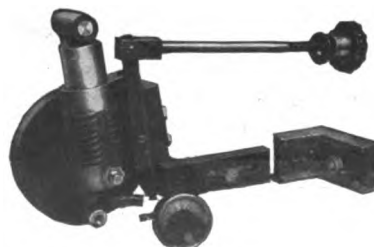


The Allen Tyrometer. Manufactured by the Allen Auto Specialty Co., 1926 Broadway, N. Y.

proper tire inflation. The importance of regulating the inflation of a pneumatic tire is generally recognized and all tire manufacturers call the attention of the public to this feature. More damage is undoubtedly done to tires by improper inflation than by any other means. The "Allen Tyrometer" is accurate and very neatly constructed. It is only 4½ inches long and fits well in the vest pocket. By pressing this instrument on the valve the pressure is immediately shown and held until you release it. The figures are large and readable and the instrument is durable. It is sold at the low price of \$1.25, by nearly all dealers, but if your dealer does not keep it in stock, you are requested to write direct to the Allen Auto Specialty Company, 1926 Broadway, N. Y., not forgetting to mention The Automobile Dealer and Repairer.

The M. & L. Power Pump.

We illustrate herewith a new tire pump, known as the "M. & L." It can



The M. & L. Tire Pump. Manufactured by W. A. McCarrell, 603 Lippincott Building, Phila., Pa.

be connected in any position, and can be run on periphery or face of fly wheel. It is adapted to any make of car where access can be had to the fly wheel, and

in the few instances where the fly wheel is encased, there is a special drive. Two ¾-inch holes are bored through the channel iron of chassis. That is the only machine work. The M. & L. Pump is installed permanently near enough to fly wheel so that a few turns of the hand wheel will bring the friction disk into engagement with the fly wheel. Why break your back in the hot sun for half an hour or wallow in the mud, besides wasting valuable time when by a turn of the wrist you can inflate the largest shoe in about three minutes by the aid of this handy machine. The saving in clothes and time, to say nothing of comfort, will quickly pay for the pump, which is reasonable in price. Write for full particulars to the manufacturer, W. A. McCarrell, 603 Lippincott Building, Philadelphia, Pa. In writing mention this magazine.

The Meteor Auto Tank.

The Meteor Tank is not a new article, but an old article in a new form. It is now a nickel plated acetylene gas tank with a gas regulator as a part of the equipment. The regulator affords a steady light no matter how far the valve is opened and does away with the annoyance of having to adjust the light several times at each lighting. For several years the Meteor Tank has been mainly sold in New England and New York City, but the company was re-organized in February of this year and is now spreading throughout the United States and have already established agencies in all the principal cities. The tests made upon these tanks by the



The Meteor Acetylene Lighting Tank. Manufactured by the Meteor Auto Tank Co., 1666 Broadway, N. Y. City.

Bureau of Explosives and other authorities show them to have withstood their severest tests such as with fire, blow torches and dynamite without fracturing or exploding these tanks. These tests were made with the tanks under full pressure of gas and showed conclusively the safety of this tank, under all circumstances. Owing to the method of packing and charging of these tanks, the manufacturer claims they will burn longer and give a whiter light than is obtainable by any other process. The Meteor Tank is manufactured by the Meteor Auto Tank Company, 1666 Broadway, New York City and with factories at Middle Haddam, Conn., to whom all inquiries and correspondence should be addressed. In writing them mention this publication.

FORD & MAXWELL OWNERS

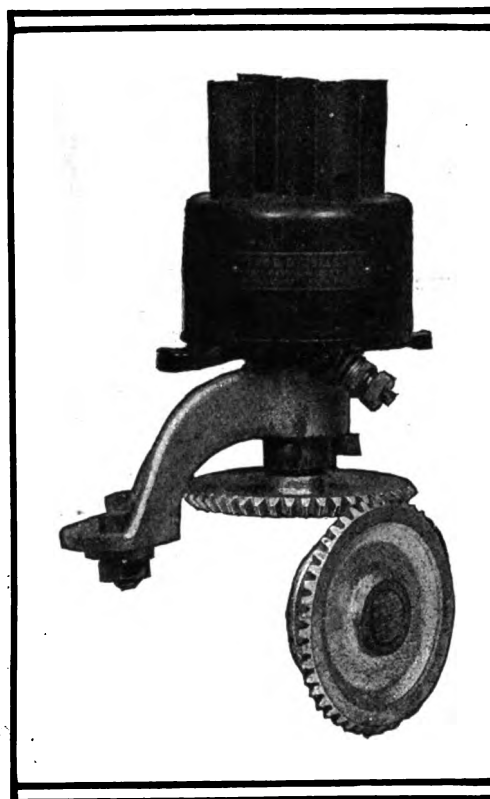
DO YOU WANT A RELIABLE IGNITION SYSTEM?

We manufacture brackets especially for your cars so that you may install the well known

Atwater Kent Unisparker

on your car and do away with all ignition troubles.

The whole outfit is shipped ready to install. No vibrators, no commutators and no weakly insulated coils to give trouble.



BRACKETS FOR OTHER CARS ALSO.

Write For Particulars

F. R. PARKER COMPANY

243 Columbus Avenue, Boston, Massachusetts



ALL DEALERS READ THIS

The long expected collapse of the Tire Chain Monopoly has arrived.

They are now bidding for your business by offering larger discounts.

WHY???

Because ATLAS CHAINS have them beat to a frazzle on mileage and do not cut the tires to pieces - and they know it.

NOW!!!

Chains will be sold on a basis of merit **ONLY**.

AND STILL

You can make more money selling ATLAS CHAINS than any other tire chain on the market.

WRITE or WIRE US

And get the best chain selling proposition ever offered to you.



ATLAS CHAIN CO.

Bush Terminal No. 4, Brooklyn, N. Y.

Cleaning the Cylinders.

In cleaning the cylinders with kerosene it is best done when the engine is warm and has just come in from a trip. Remove the plugs and squirt one-third quart of kerosene into each cylinder, taking pains to squirt the oil around on the walls as much as possible. Replace the plugs and let stand several hours. Then start the engine to burn out the oil, and carbon that has been loosened. A dense smoke will issue from the muffler exhaust until all the kerosene is burned. Clean the plugs and the engine will run without a miss if the other parts are mechanically right.

Keep All Old Tubes.

Do not throw away or sell for scrap old inner tubes which have sound sections of unperished rubber. By saving the old tubes and cutting out the sound sections and sending them to a tire company, they may be joined into a new tube. While this jointed tube is not as pretty as one just from the factory, it will be found capable of giving extraordinary service and when the shoe is put on, no one but the owner will know how the inner tube looks.

Tire Uncertainty.

"I've often wondered," says an automobilist, "if some folks don't put an extraordinary good set of tires on a car when they send it out from the factory. The reason I wonder is this: The set of tires we had on our machine when first we got it lasted a lot longer than other tires of the same type that we got afterward. The tire folks say that is purely accidental. They say they can't tell whether a tire will wear well or not, even if they know it comes from a supply of rubber that has produced other good tires. If they don't know about it the average man is entitled only to guess, too."

Electric Trucks.

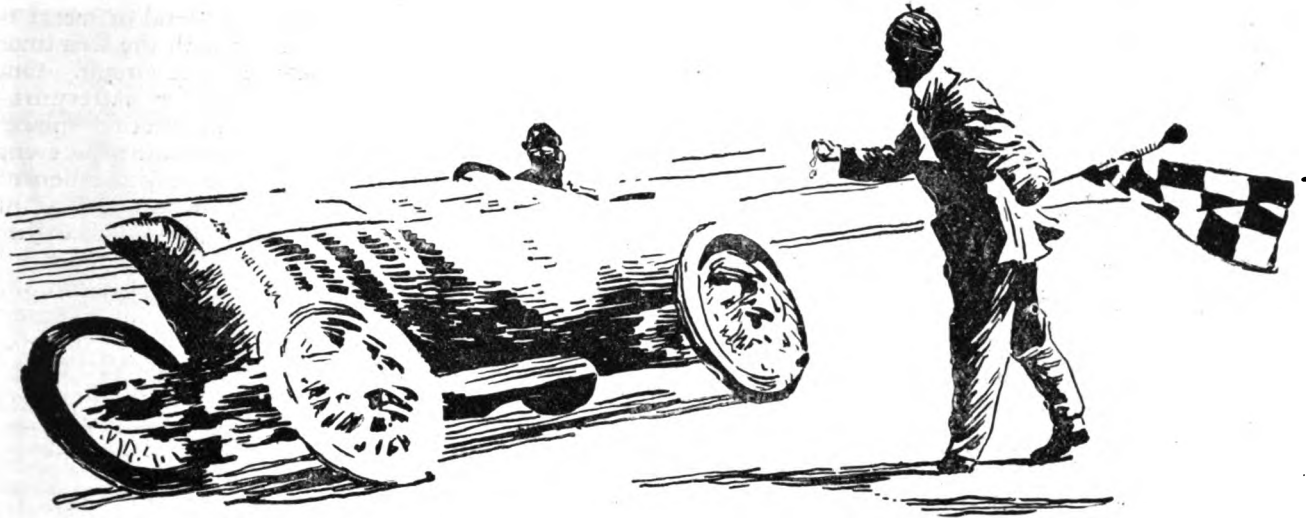
A heavy electric truck could not be driven more than eight miles an hour, but this is about three times the speed of a good team of Percherons. This same relative slowness, in comparison with a gasoline car, also counts for durability. You can knock almost any speed you want out of a gasoline engine, but don't for one moment forget that you do knock it out. You may drive a heavy gasoline truck at twelve miles an hour, if you wish, but you are also hastening its journey to the scrap heap.

Washing a New Car.

It is a good plan to wait several days before washing a new car. When received, it can be showered with cold water to advantage. In washing, use only good soap and get it washed off quickly. Do not squirt water on a varnish finish, either through a nozzle or by the placing of the thumb over the end of the hose. A good washer is always worth the higher price he demands.

Tires are saved by coming slowly over the top of a hill before the descent begins, taking corners slowly, and using the brakes gently. Tires are injured by coming fast on to a descent and then checking; by going fast round corners and putting on brakes hard and suddenly, or in starting too fast or with a jerk.

The successful self starter is one of the things most to be desired for gasoline cars at the present time. Several types of self starters are being projected and it will not be many seasons until a device of this kind applicable to all cars will be perfected.



Polarine

"The Winning Oil for Winning Cars"

"To-day I lowered my world's records for the mile and kilometre; also established a world's record for two miles. Time for kilometre 15.88 seconds; for mile 25.40 seconds; for two miles 51.28 seconds. Used Standard Oil Gasoline and POLARINE in practice and in final trials and it helped me break records. Nothing but POLARINE for me from now on."—Daytona, Fla., April 23rd, 1911.

(Signed) BOB BURMAN.

"When examined carefully after the trials, the Blitzen Benz was found to be in as perfect condition as ever."—*New York Times*.

**This accomplishment again proves that POLARINE
is the best automobile oil yet produced.**

Are You Using Polarine on Your Car?

If you cannot obtain it from your dealer, write our nearest Agency.

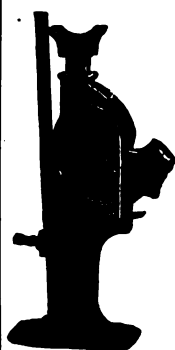
Standard Oil Company
(Incorporated)

Smethport Full Value Inner Tubes and Rolliners Are Guaranteed To Give Satisfaction.

On sale at the following Agencies and Garages:

Cyrus L. Hoch, South Bethlehem, Pa.
 Peter C. Hansen, 8 13-23 Tatnall St., Wilmington, Del.
 National Supply Company, 1115 Farnam St., Omaha, Neb.
 Standard Tire & Rubber Company, 102 Portland St., Boston, Mass.
 George Reed, 1314 New York Ave., Washington, D. C.
 William Stellwag, 822 N. Park Ave., Philadelphia, Pa.
 Col-Mac Company, 250-52 South St., Newark, N. J.
 D. B. Smith & Co., Utica, N. Y.
 Rose Bros. Auto Co., Maple Ave., Greensburg, Pa.
 Wallace-Donnelly Co., Jamestown, N. Dak.
 C. M. Bonner Company, Northport, N. Y.
 Thos. W. Haines, Jr., Wilkes-Barre, Pa.
 Howland Auto Co., Amsterdam, N. Y.
 Auburn Automobile Co., Auburn, N. Y.
 American Motor Sales Co., Erie, Pa.
 Star Garage, Erie, Pa.
 Keystone Rubber Mfg. Co., Erie, Pa.
 Backus Novelty Co., Smethport, Pa.
 A. Goyert, Greensburg, Ind.
 R. M. Dunn, Coudersport, Pa.
 J. L. Radebaugh, Bradford, Pa.

SMETHPORT RUBBER COMPANY, Smethport, Penna.



Buy Your Jacks Direct from the Factory.

Not long since we received an order for one thousand Jacks from one of the leading Auto Supply Houses.

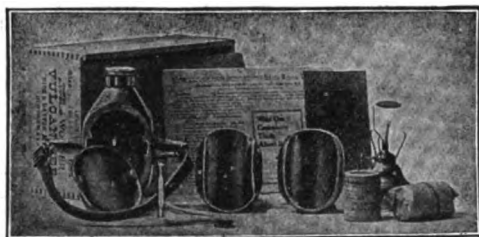
Write us for our latest price list.

Vanderpool Bros.,
Springfield, Ohio.

PACIFIC COAST BRANCH:
 824 S. MAIN STREET, LOS ANGELES, CAL.

Little Wonder Vulcanizer

Worth
 the Money



Because it does what we claim for it. **REPAIRS** automobile and motorcycle tires perfectly. You can do it with a

LITTLE WONDER VULCANIZER

Iron Model \$7.00, Aluminum Model \$8.00, any size

RICE & DAYTON MFG. CO.

Cedar Falls, Iowa

U. S. A.



SAVE YOUR TIRES

PRICE

\$1.50

By attaching to your pump a safety tire gauge. Pump your tires to the prescribed pressure and double the life of your tire. Worth \$100 to any motorist. Sold for \$1.50.

All dealers or by mail on receipt of price and 6c postage.

SAFETY TIRE GAUGE CO.
 25 N. Franklin Street Chicago

Care of the Storage Battery.

The storage battery should be kept in a case by itself with a tight cover so that no metal or metal tools of any kind can come in contact with the terminals or binding posts which will cause short circuit. One of the principal troubles in the storage battery is the buckling of the plates causing an internal short circuit. By buckling of the plates is meant the twisting or bending of the plates so that a bulge or bend in a positive may come in contact with a negative plate. Buckling is due principally to too rapid charging or too rapid discharging.

If the positive and negative plates of a fully charged battery were connected the discharge will be so active and vigorous that the plates are liable to become quickly buckled and badly twisted so that they will come in touch with each other. It will therefore be apparent that to handle a storage battery it is important that short circuits be avoided and also that the charging current be not over strong.

Another trouble is the oxidizing of the brass terminals and the fumes of the acid through the vent holes. The acid thus collecting on the cover of the cell may cause a connection from one terminal to the other. This can be overcome by cleaning the terminal thoroughly with a solution of ammonia and water and painting them thoroughly with paraffine wax. Another preventive of terminal corrosion is to use the rubber sleeve that can be had to slip over the wire before it is fastened to the terminal after which it is slipped down to cover both terminal and the uninsulated end of the wire which is fastened to it.

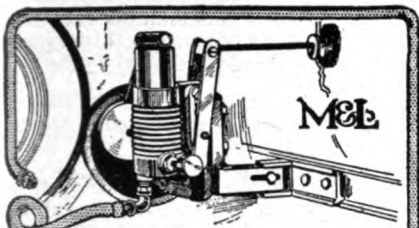
Tire Pumps and Pressure.

Before inflating an automobile tire with a pump it is always well to give a few strokes on the pump before attaching it to the valve. The object is to blow out any grit which might impair the valve in the pump. Such a precaution should be taken whether the pump be of the hand variety or one of the many types operated by power. The task of blowing up tires has in the last year been greatly simplified, not only in the actual effort required but also in obtaining the proper pressure for the best service. Some garages carry as many as seven styles of hand-operated pumps, many of them of the duplex or compound type, and some of them triplex, compounding so that the pressure obtainable is far in excess of any ordinary needs. In addition to these there are numerous styles of engine-driven and automatic power pumps designed for different classes of service. Some are for garage use and others are applied directly to the engine of the car. Supplementing the pumps themselves is a long list of devices designed to show the pressure in each tire. It has been found that the proper pressure according to the weight and service saves many dollars in tire cost.

Cleaning Spark Plugs.

Some spark plugs are designed to be taken apart for cleaning, while others are not made to take apart, but instead are self-cleaning to a certain degree. In cleaning plugs that can be taken apart, first remove the porcelain core and brush off the carbon deposit with a tooth brush dipped in gasoline or ammonia, then scrape off all the carbon from the rest of the plug, brighten the spark points, and reassemble. Plugs that cannot be taken apart easily should be brushed out well with ammonia and the points brightened.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



Don't Break Your Back

inflating tires with the ancient hand pump—be abreast of the times and have full tire inflation in less than three minutes by attaching an

(PATENT PENDING)
M&L
POWER TIRE PUMP


to your car. The "M. & L." Pump can be attached in any position—can be used on any car. Very easily operated—just connect the hose to the tire valve, start the pump, watch the registering gauge and stop it when tires are properly inflated. No wrenches nor any tools required. Valves ground to a seat—no packing to wear loose. The "M. & L." is built like an engine—each one tested to 150 lbs. Price

\$22.50

freight paid to any point, complete, including brackets, guaranteed gauge, a 12 ft. high pressure hose. Money back if you are not enthusiastic about the "M. & L." Power Tire Pump.

W. A. McCARRELL
Sole Distributor

603 Lippincott Bldg.
Philadelphia, Pa.
Agents wanted. Write for liberal proposition.



Removal.—The Superior Welding & Machine Company has recently moved its welding plant to a more spacious building and has added to its outfit a well equipped machine shop, thereby insuring a still better execution of all the repair work entrusted to it. The new address is 680 Canal street, Stamford, Conn.

Jacks from the Factory.—Vanderpool Brothers of Springfield, Ohio, have an announcement in this issue of their jacks, which they sell direct from the factory. They want our readers who may be interested to write at once for their latest price list. They say that they received an order recently from a leading automobile supply house for one thousand of their jacks. In writing mention The Automobile Dealer and Repairer.

"Firestone"

TIRES

Most Miles Per Dollar

IT IS THE DURABILITY, the peculiar wear-resisting quality of Firestone tires, that has placed them in a class by themselves in the eyes of the motoring public.

Motorists of experience instinctively class Firestone tires above the rest, radically superior to the popular-priced grade of tire. They learn to expect more service from Firestone tires—the most miles for every dollar of cost.

To secure this extra mileage we build Firestone tires to an *exclusive* standard of wearing quality. The quality that eleven years of making rubber tires *exclusively* has taught us yields the utmost wear.

Our manufacturing is concentrated under a single management, into one factory—the largest and most modern of its kind. Our total "overhead" expense is reduced to a minimum and divided over the largest exclusive tire output in America, giving to every Firestone tire an extra proportion of intrinsic service-value per dollar.

The exclusive quality of rubber and fabric built into Firestone tires increases the cost of making. Yet it adds only a trifle to the selling price of each tire and pays you back many times over, in extra miles of service—the *most miles per dollar*.

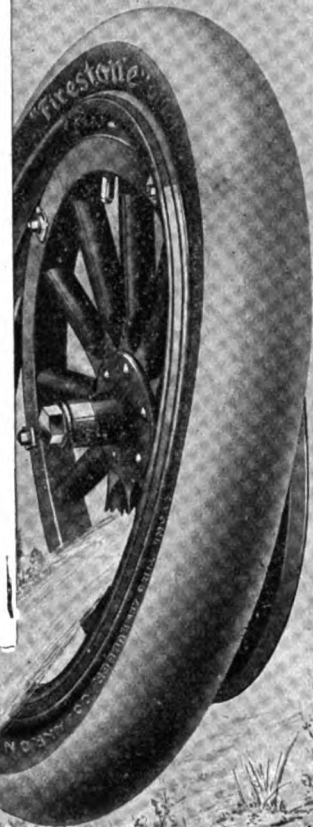
All the standard types: Regular Clincher, Q. D. Clincher and Straight Side or Cable Base Cases and Inner Tubes, Smooth Treads for regular service, Non-Skids for slippery streets.

Firestone Quick-Detachable Demountable Rims to carry your spare tires inflated, ready for instant use.

THE FIRESTONE TIRE & RUBBER CO.,
AKRON, O.

"America's largest exclusive tire and rim makers."
Branches, agencies and dealers everywhere.

Firestone Tires
Most Miles Per Dollar



EBERMAN AUTO POWER TIRE PUMP

The AUTO ENGINE does the work, inflates the tires. Guaranteed to give satisfaction and to do all and more than we claim. It's a labor saver.

Agents Wanted Write To-day
HARRY H. REYNOLDS
254 Dearborn Street Chicago, Ill.

It will doubtless be of interest to the automobile trade to know that S. H. Feigley, formerly sales manager for the Pitner Pump Company, has allied himself with James L. Gibney & Bro., 215 North Broad street, Philadelphia in their ambitious campaign in connection with the Gibney Eleck-Trick Vulcanizer.

BAIR AUTO TOP HOLDERS

"They Hold"

GOTSHALL-BAILEY SALES CO.

DISTRIBUTERS

1254 Michigan Ave.,

Chicago, Ill.

VULCANIZERS

Three Cavity and Inner Tube, also Air Bags, Bead Molds, &c., at very reasonable prices.

WRITE FOR BOOKLET

The O'Neil Tire & Rubber Company
AKRON, OHIO

MILLER'S VULCANIZERS AND TIRE RELINERS.

First quality Imperial Clincher, Dunlop 5 per cent. higher. Nearly all standard makes of tires at dealers' lowest prices.

Net Trade Prices.

Inches	Each	Inches	Each	Inches	Each
28x2½	\$2.20	30x3½	\$3.80	34x4½	\$5.60
28x3	2.75	30x4	4.30	35x4½	5.70
30x3	2.85	31x4	4.40	36x4½	5.80
32x3	2.95	32x4	4.50	37x4½	5.95
28x3½	3.30	33x4	4.60	38x4½	6.05
28x3¾	3.30	34x4	4.75	34x5	6.30
30x3¾	3.40	35x4	4.85	35x5	6.45
31x3¾	3.45	36x4	4.95	36x5	6.60
32x3¾	3.50	40x4	5.55	37x5	6.75
34x3¾	3.65	32x4½	5.50	38x6½	8.20

TERMS—Cash with order; money refunded on receipt of goods if not satisfactory. If interested in vulcanizers and rubber specialties, write for our 28-page catalog. We also do tire repairing.

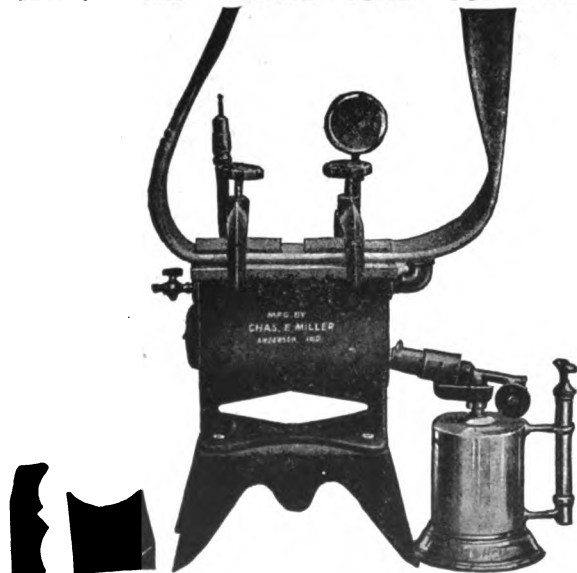
If you want liners made of 14-oz. cloth instead of 19-oz. you may deduct 20 per cent from these prices. If interested in bicycle or automobile tires, either first or second quality or second hand, write for prices.

Miller's Tire Reliners.

Are made of three and four ply 19 ounce tire fabric, vulcanized in shape to lay on the inside of the casing, extended clear around to strengthen same. Can either be cemented in or laid in loose and makes the tire difficult to puncture, also reinforces weak casings. Packed neatly one in a box.



MILLER'S NEW STEAM TUBE VULCANIZER.



The above is a new steam tube vulcanizer that we are just placing on the market. It is especially adapted for repairing automobile inner tubes. Has a machine surface 5x19 inches, and will repair two tubes at one time. The steam is generated from a common blow torch flame, which passes through a flue 20 inches in length, giving heat surface sufficient to generate 40 pounds of steam in ten minutes. It is furnished complete by us, with pop valve, steam gauge, 2 clamps, base and gasoline blow torch for \$15.00; without blow torch, \$12.50. Jobbers who wish to catalog same, write for cuts.

CHARLES E. MILLER, Anderson, Ind.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Miller's Circular Lock Patch.

Is made of heavy tire cloth vulcanized to encircle the inner tube and formed to the natural shape of the inside of a tire. By encircling the inner tube you get much greater efficiency than it is possible to get by laying the patch over a hole in the casing. You can also use this patch for a rim cut as there is a thin edge which can be brought around under the tire, giving great strength at this point.

PRICES.

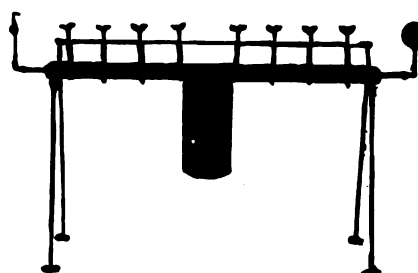
2½ inches, each \$0.78 | 3½ inches, each \$1.08 | 4½ inches, each \$1.38
3 " " .90 | 4 " " 1.20 | 5 " " 1.50

Miller's Inner Tube Patches and Valve Seats.

Made of good grade rubber and in all sizes. Where extra large quantities are ordered can put the customer's name on patch.

Price, \$2.50 per Pound.

Miller's Inner Tube Vulcanizer.

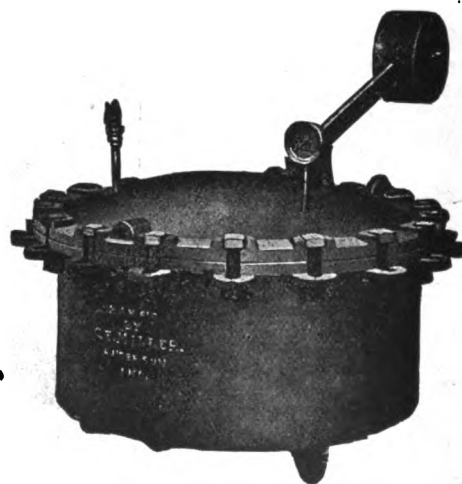


Has a tube plate 54 in. long and 4 in. wide with plain surface highly polished, complete with stand, 12 fine boiler, gas burner, water glass, pop valve, steam gauge, 8 clamps and two molds for curing the treads of casings, price \$25.00; gasoline burner \$2.50 extra. Tube plate only with steam

gauge and 6 clamps, price \$10.00.

We also manufacture various other vulcanizers. No. 1 and No. 2 adjustable sectional vulcanizers, complete with boiler, \$35.00 each. Bicycle vulcanizers, \$7.50; Motor cycle vulcanizers, \$12.50; Tread Rollers, \$12.00; Kettles, \$115.00; Power wrapping machines, \$175.00 each. We do all kinds of tire repairing and carry a large stock of tires at reasonable prices. If further interested in vulcanizers write for catalog and special proposition.

MILLER'S KETTLE VULCANIZER.



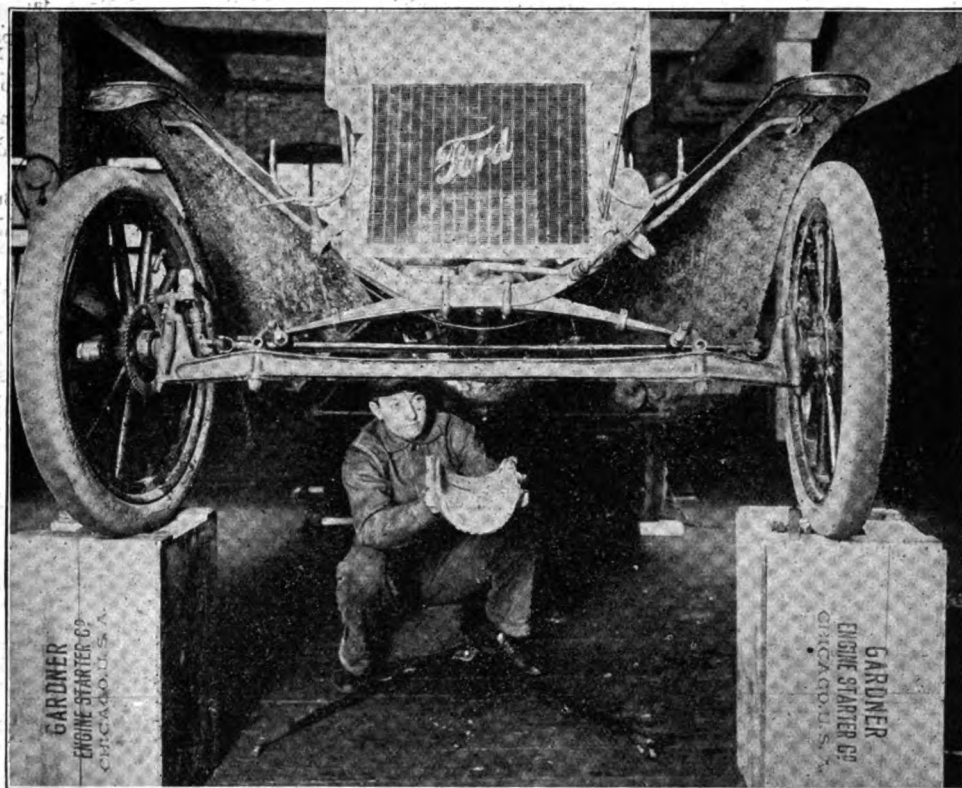
This kettle vulcanizer is made in two sizes; small size weighs 2000 lbs., holds from 5 to 8 tires at one time, up to 38 inches. Price, \$115.

Large size weighs 2500 lbs., holds from 7 to 10 tires at one time, up to 44 inches. Price, \$150.

If you are interested in other styles of vulcanizers write today for our catalog, showing 27 different kinds we make. We also manufacture a full line of repair materials.

Write for samples and prices. They are interesting.

THE GARDNER AUXILIARY ENGINE BASE FOR FORD "T" CARS.



It costs \$15.00 to \$20.00 to make the average crank case repair in the Model "T" Ford engine, and this expense must be repeated each time an adjustment is made, piston rings installed, push rods replaced, etc., and the expense during the season becomes excessive, not to speak of the annoyance.

THE GARDNER AUXILIARY ENGINE BASE was designed to save the Model "T" owner this great expense.

The old method requires that the engine be removed from car to make the slightest repair in the crank case, this taking from one to two days' time, whereas with the Gardner Auxiliary Engine Base installed on car, access to the parts in the crank case is accomplished in a few minutes.

GARDNER ENGINE STARTER CO., Chicago, Ill.

Gentlemen:—The truss and base sent me, received and have been put on my car. The truss makes the car run 50% easier. The base fits perfectly and does not leak, besides has already paid for itself three times, for had to put in a new crank bearing. With the base the job was done in a little over an hour with a cost of \$1.00. Otherwise would have been between \$30 and \$40. Am enclosing check for which send me another truss for short bearing like one sent me. Any one wanting to know anything about the two above equipments, give them my address and I will take pleasure in writing them.

March 27, 1911.

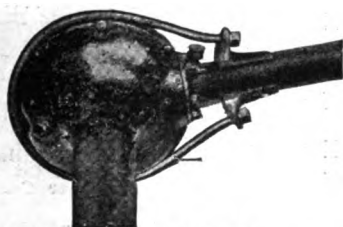
Yours very truly,

(Signed) Dr. F. B. HENDERSON, 331 Washington Avenue, Greenville, Miss.

Shipping weight of Gardner Auxiliary Engine Base, 6 lbs. PRICE, \$15.00 F. O. B. CHICAGO.

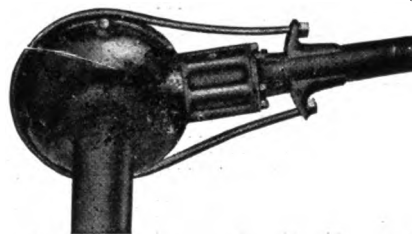
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THE GARDNER TRUSS FOR FORD "T" REAR AXLE.



Placed on Car in 3 Minutes.
Order Short Truss for cars equipped with Babbitt Bearing

Order Special Truss for 1911 Model "T."



Placed on Car in 3 minutes. Keeps the Two Joints Solid.
Order Long Truss for cars equipped with Roller Bearing.

This device will hold the three parts of rear axle and shaft tube as solid as if made of single piece of steel, and will prevent the rocking and chattering of rear axle when starting and stopping car. It will also prevent the leaking of grease from these parts, insuring perfect lubrication to differential pinions and bearings.

A groove in the loop straddles the thin edges of the differential housing, sealing it solid.

PRICE, \$3.00 F. O. B. CHICAGO. LIBERAL DISCOUNT TO DEALERS

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Revolving Cases.

The illustration represents the new revolving case manufactured by the American Bolt & Screw Case Company, of Dayton, Ohio. It has square drawers ranging in various sizes. They also make a case the same style with stationary base with larger drawers. The drawers are locked in these cases to pre-



A Fine Revolving Case.

vent their removal, so that the contents of the drawers are not apt to get mixed. This case was designed for stores that desire to carry a stock of screws and bolts in one case. They are also very convenient for carrying a variety of articles. Each case is provided with a substantial card-holder, and they furnish with each case a quantity of blank cards so that purchasers can label the drawers to suit their stock. This company also make a variety of other square and octagonal cases for screws, bolts, etc. Their cases are sold by the leading jobbers throughout the country. Write for their May 1st catalogue.

USED CAR BARGAINS!

During the ten years in which we have been established, selling new and used Automobiles we have sold to thousands to their profit and satisfaction, which statement we make here because we want your patronage, and urge the advisability of dealing with a house of established responsibility.

Further we wish to say that never in our experience have we seen a time when a buyer could get so much for his money as right now, when we are offering

At Strikingly Low Prices

ABSOLUTELY

Late models standard make

New 1911 LOZERS

Two styles of body and

Used Cars

1906 6 cylinder Thomas, 1908 Packard Roadster, 6 cylinder Alco Touring and 1910, one or more of each, Regal, Maxwell, Fords, Buicks, Oldsmobiles, Cadillacs, Chalmers, American, Pope-Hartford, Mitchells and many others.

New 1911

ALL EN-KINGSTON AT REDUCTIONS FROM LIST.

Also NEW

Paige Detroit

SNAPPY, POWERFUL LITTLE RUN-ABOUTS selling regularly at \$1,000. Our price, \$465.

NOTE OUR ADV. OF BARGAINS IN TIRES, BODIES, TOPS, WINDSHIELDS, &c., &c.

TIMES SQ. AUTO CO.

1708 TO 1710 BROADWAY

Near 54th St.

Phone, 7866—Col.

the sizes so that customers who formerly dealt with the branch store can obtain the same service from the Beckley-Ralston Company.

The Ideal Shock Absorber.—This device is manufactured by the Thomas Auxiliary Spring Works of Canisteo, N. Y. They say when applied to a car it gives the same steady soft riding features with a light load as it does with a heavy load. It also stops vibratory motion and it is claimed makes a four-cylinder car ride like a six-cylinder. Write to the address above for descriptive circular giving full particulars regarding this shock absorber.

Bodies.—The La Porte Carriage Company of La Porte, Ind., make a specialty of first-class bodies, in wood or metal. Finished in the white or painted and upholstered complete. Write to them for further particulars.

Yankee Tires and Tubes.—The Manufacturers of the new 1911 Yankee Tires and Inner Tubes announce in this issue that they can save our readers considerable money on tires. The Yankee tires are made with white rubber treads of the finest quality. They will fit any Quick Detachable Rims, also Clincher or Dunlop. The Yankee inner tubes are also highly recommended, being made of the finest Para Rubber and cured by the latest and best methods. The prices of the Yankee tubes and tires will astonish you, if you will take the trouble to send for their 1911 price list to the Yankee Company, 69 Genesee street, Utica, N. Y. You had better send for this price list at once, before you forget about it, and in writing, kindly mention The Automobile Dealer and Repairer.

Automobile Lamps.—Automobile and carriage lamps are manufactured and repaired by Holt & Beebee, 40 Sudbury street, Boston, Mass. Readers who have broken lamps are urged to send them to this reliable firm for satisfactory repairs, which will be promptly done and at a low rate. Holt & Beebee also manufacture a complete line of automobile lamps and their product is well known to the trade. Prices on any style will be cheerfully furnished on application. In all correspondence mention this magazine.

Wearwell Specialties.—In this issue will be found the full-page announcement of the Wearwell Rubber Company of Kokomo, Ind., with illustrations of a few of their specialties consisting of raw materials for repairmen, cements, kettle vulcanizers, boilers, mechanical rubber goods, tube repair kits, cement patches, lace boots, blowout patches, small repair vulcanizers, etc. They will send their illustrated catalogue to any reader who may be interested. In writing for it, please mention this paper.

Radiator Repairs.—The Rome-Turney Radiator and Manufacturing Company of Rome, N. Y., has a new announcement in our columns this month. They make a specialty of repairing and renovating radiators and they would like to have our readers write them for estimates. It is a well-known fact that the average local repairman has inadequate facilities for dealing with radiator troubles and it frequently pays to send the radiator for repairs direct to a good radiator factory. If you wish to have your radiator repaired it will be a good idea to send it by express to the Rome-Turney Radiator & Manufacturing Company, and they will promptly forward an estimate as to its cost.

"Double the Life of Your Tires."—This is part of the heading of the half-page advertisement in this issue of the Dal Manufacturing Company, 116 E. 24th street, Chicago, Ill. They say with their "Trojan" Tire Pump, you can inflate all your tires to the same pressure. The automatic indicator makes this absolutely certain and what is more you can see it yourself. Of course it needs no argument to prove to any car owner that tires unevenly inflated must wear unevenly. It also needs no argument to prove that tires need a certain pressure all the time and should be kept up to that pressure. Tires are expensive and anything that will prolong their life is worth considering. Write at once to the above address for a leaflet entitled "The One Right Way to Pump Your Tires." It will give you some valuable information.

Repairing.—Repairmen will be interested in the announcement in this issue of the Rhineland Machine Works Company, 140 West 42d street, New York. This company manufactures the "Rhineland" ball bearings and keeps a special stock on hand all the time for the repair trade.


The Leather Tire Goods Company of Niagara Falls, N. Y., who have maintained a branch store at 1407 Michigan avenue, Chicago, Ill., in charge of V. W. Boham, have discontinued this branch and Mr. Boham will in the future devote his time to visiting the trade in the larger cities of the middle West. The Beckley-Ralston Company, 80 Michigan avenue, who have been one of the largest distributors of "Woodworth Treads" for the past two years are putting in a full stock of all

Please mention the Automobile Dealer and Repairer when writing to advertisers.

GOOD ROADS ARE NOT NECESSARY

IF YOUR CAR IS EQUIPPED WITH

SKINNER RECOIL CHECK



"THEY MAKE YOUR CAR RIDE SMOOTH ON ROUGH ROADS"

"Eliminate all Spring Breakage"

"Make Motoring a Pleasure"

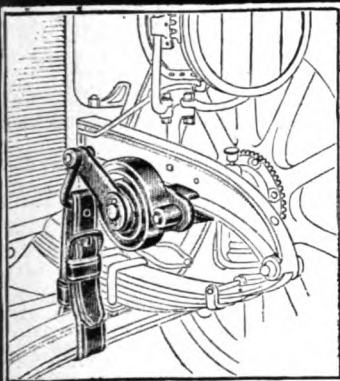
They act in harmony with the road, adjusting themselves to boulevards and rough roads alike. Do not interfere with or stiffen the springs, but prevent the reaction and up-throw jolts. Nothing to wear out or get out of order, and a set will positively prevent all spring breakage.

CLAMP ON THE FRAME. NO HOLES TO DRILL. So simple that anyone can attach a set in a few minutes' time. Don't put up with the discomforts any longer. ORDER TO-DAY.

\$20.00 per set of four, for cars weighing under 3,000 lbs.
\$25.00 per set of four for cars weighing over 3,000 lbs.

Give name of Car, Model and Year Made.

SKINNER & SKINNER CO.
 Manufacturers
 1718 Michigan Ave., CHICAGO, ILL.



Here is an Opportunity to Get a High Grade Touring Cap FREE.



You can get a hat for yourself, for your friend, perhaps your entire family can obtain hats **FREE**. If you are interested, write us. We will send you full particulars. This is no catch-penny scheme but a genuine offer and the proof of it is to put us to the test.

Just write us, asking for our Catalog, Edition No. 26, and full particulars will be sent. Send us a postal at once, and let us introduce you to the most extraordinary offer that has ever been presented to motor car owners.

Ask for Your Copy To-day!

35% AUTOMOBILE SUPPLY CO.,

A. B. NORWALK, Pres.

New York,
 1783-5 Broadway at 58th St.

Main Offices,
 97 Chambers St., N. Y.

Chicago, Ill.,
 1508 Michigan Ave.



Tire Troubles Stopped

Wear the treads completely off your tires without puncture, 'blow-out or rimcut by inserting the
DAYTON INNER TIRE

Inexpensive

Inserted and removed and placed in other tires by anyone.
 Write for a descriptive price list to-day.

DAYTON INNER TIRE & MFG. CO., 19 Madison St., Dayton, Ohio



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WANT ADVERTISEMENTS.

Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of three cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 50 cents, however small.

Remittances can be made in postage stamps if more convenient. Address.

MOTOR VEHICLE PUBLISHING CO.,
24 MURRAY STREET, N. Y. CITY.

AUTOMOBILE INSTRUCTION.—The West Side Y. M. C. A. Automobile School gives a practical course in shop and road practice in four or eight weeks, day or evening. Provision made for out of town men. 822 West 57th St., N. Y. City.

SEND US YOUR BROKEN CYLINDERS,

and crankcases to be welded at less than one-quarter the cost of new ones. Work absolutely guaranteed. Pay only after testing. Write for references and prices. Waterbury Welding Works, Waterbury, Conn.

TOPS.—Until further notice, runabout top \$20, touring car tops \$35. C. G. Meyer & Son, Tiffin, Ohio.

FOR SALE.—New folding wind-shields, complete with brass rods and fittings, each \$12.50. Touring bodies, painted and upholstered, will fit any standard chassis, \$75.00. Slightly soiled 34x4 Hartford Dunlop casings, run less than 50 miles, \$25.00. New radiators and hoods, 22-25 h.p. (blue print on application), \$22.50. Mufflers, all styles, \$4.00. Shaft drive rear axles, made by the American Ball Bearing Axle Co., complete with brakes, brake drums, hubs, hub caps, etc., \$90.00. Tubular axles, complete, \$22.50. Single chain drive rear axle, \$15.00. We ship any of these c.o.d. with privilege of examination if a deposit sufficient to cover transportation charges both ways accompanies the order. Send for Bulletin No. 8. Automobile Appliance Co., 1714 Michigan Ave., Chicago, Ill.

PATENTS SECURED.—C. L. Parker, patent attorney, ex-examiner Patent Office, 962 G Street, Washington, D. C. Inventor's handbook upon request.

PERFECTION QUICK REPAIR PATCHES. For inner tubes. Simply moisten with gasoline and stick on. Send 75c. for box of samples. Agents wanted. Write for terms. Central Penna Auto Co., Harrisburg, Pa.

STEAM CAR CORRESPONDENCE SCHOOL. Finely written and illustrated course. Only school in world. Circular sent. 520 Fourteenth Street, Denver, Col.

Broken Crankshafts, Crankcases, Gears,

Flywheels, Welded. Pay after you test them. Broken cylinders made new \$3.35. Atlas Welding Works, Rahway, N. J.

FORD OWNERS.—Drop us a postal for our catalog. It will save you money. Auto Parts Co., Providence, R. I.

FOR SALE.—"Steam Car Owners" Myers Kerosene Burner—Something new. Send for circular, 729 West Colfax, Denver, Colorado.

SEATS.—Double Rumble Automobile Seats for Runabouts; size 40"x20 1/4" on bottom; back 19"; ironed and trimmed black leather, spring cushion, in priming coat, \$25; painted complete \$30 net cash. Prompt deliveries. Schubert Bros. Gear Co., Oneida, N. Y.

LEARN AT HOME, in a few evenings, how to construct, operate and repair Automobiles, Commercial Trucks, Flying Machines, Motorcycles, Motor Boats, Gasoline Engines, Electric Motors. Big demand, with good pay for competent men. Thousands of positions open. Let us help you in place and pay. A postal card will do. Address—**EXTENSION DEPARTMENT,** The Charles C. Thompson Co., 549 Wabash Ave., Chicago, Ill.

CYLINDERS REGROUND, and fitted with new pistons and rings for \$15.00 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. Phosphor bronze bushings in the rough carried in stock. Address The Adapt Machinery Company, 1624 Wabash Avenue, Chicago, Illinois.

AUTOMOBILE CYLINDERS rebored, ground, including new piston and rings, \$15. Electric and belt-driven Tire Air Compressors our specialty. Cast Iron Brazing Co., Manchester, N. H.

AUTO TOPS Rebuilt, Repaired, can save you money. Rubber and Mohair Dust Hoods for model T Ford Touring and Roadster, 1911 cars, Leather Fore Doors, if wise get our prices, Haews Storm Front Co., Coldwater, Michigan.

BUILDING or repairing an auto? If so, send for list and state your wants. "Mail Order" Garage, 8 Fox St., Bridgeport, Conn.

PATENTS.—Manufacturers want Owen patents. Send for free 72-page guide book and list 200 inventions wanted. R. B. Owen, Dept. 39, Washington, D. C.

Don't Metal Polish Your

life away, but finish the brass parts of your auto with Stay Shiny—The Marvelous Tarnish Preventive, and have them look gold plate all the time. Saves hard, dirty work, time and money. One invisible coating preserves original high polish and absolutely prevents tarnish on lamps, radiators and trimmings for months under heat, rain, and all weather conditions. Easily applied, easily removed when desired and non-injurious to metal. Fully guaranteed. Price \$2.00 pint can, with brush. Express prepaid. A year's supply. Thousands of auto owners are delighted users of this long looked for preparation. Agents wanted. Easy seller. Big profits. If not sold by Dealer, will send can prepaid upon receipt of price. Write me right now.

F. H. SCHMOEGER
Sterling, Ill.

"SPECIAL SALE on High-Grade lamps. Write for prices. Autoparts Mfg. Co., Detroit."

FOR SALE.—\$300—\$475. Four Brand new 1910 High Wheel motor cars, two and three cylinder, 12 and 18 horse power, air cooled, 2 cycle, valveless engines, engines in front under hood, friction transmission ten speeds forward and reverse, 36 and 38 inch wheels, solid tires, steer wheel, equipped with top, horn and lamps. Two cylinder sold for \$750. Three cylinder sold for \$875. Box 54, Beavertown, Penna.

WILL TRADE Reo Touring Car for 1911 Brush or Metz Runabout. H. E. Burlingame, Box 1435, Providence, R. I.

FOR SALE.—One three ton truck incomplete, one 40 horse power Knox air-cooled motor with magneto, one four cylinder motor incomplete, one six-cylinder motor incomplete. Address, Crone, 334 Genesee Street, Buffalo, N. Y.

CLOSING OUT BARGAINS.—Motor cycle \$40. Electric automobile \$60. Fourteen other bargains. Postal-card gets bargain sheet. Cash or exchange. T. S. Culp, Canton, Ohio.

MAXWELL, BUICK, FORD, BRUSH and REO owners write us at once and ask for catalog. Grand Haven Auto Body Co., Grand Haven, Mich.

FOR SALE.—Waverly 1 1/2 ton electric truck, nearly new, at a low price. F. S. Howard, 16 Melville St., Worcester, Mass.

IGNITION.—Send 25c. coin or stamps, for a three months' trial subscription to IGNITION—the big new monthly magazine specializing on engine troubles. Carefully and practically edited; profusely illustrated; handsomely printed. Helpful from cover to cover. IGNITION, 328 S. Dearborn St., Chicago, Ill.

TO EXCHANGE.—One Parker double hammerless shot gun with case, worth \$35.00; one Victor D talking machine, with one hundred records, all in good cases, worth \$200.00; one top for Ford touring car in fine shape, good as new. Want small screw cutting engine lathe, write me what you have. F. R. Marrs, Wolford, No. Dak.

FOR SALE.—White 1906 Steamer, \$350.00, White 1905 Steamer \$250.00, White 1904 Steamer \$200.00, Grout 1905 Steamer \$250.00, Lane 1908 Steamer \$350.00. All in first-class running order and have good tires. Some have tops. Write for particulars. Also any parts of Prescott, Locomobile, Mobile, Stanton, White and other steam autos at reasonable prices. Write for list, E. L. Marshall, 34 Vernon Avenue, Lake View, N. J.

RADIATORS.

Their proper and expert repair is our business. No radiator is so badly damaged that we cannot save the owner greater part of cost of new one to replace it. Quick, prompt service, satisfactory workmanship and a fair charge are the inducements for your patronage—it's producing results.

Manufacturers of the AERO cellular honeycomb type radiator. Fenders, Hoods, Tanks, Lamps and all sheet metal parts pertaining to the automobile manufactured and repaired.

Aero Sheet Metal Works

1349 Wabash Ave.

Phone. Calumet 5352

CHICAGO, ILL.



The Livingston Radiator

PROVED BY TEST

Radiators made or repaired for any type car.

Have a new radiator made for your car and increase its value . 25 per cent.

Our corps of expert repairmen at your service. All charges based on time consumed. Results guaranteed.

Send in your old radiator and get estimate.

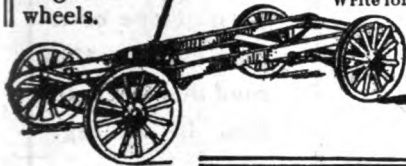
LIVINGSTON RADIATOR AND MFG. CO.

139 W. 52d St., New York City

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AUTOMOBILE

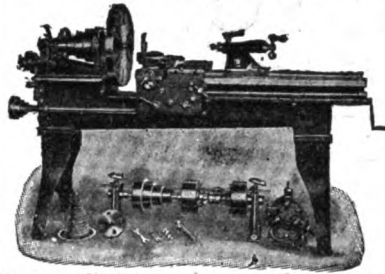
Running Gears, with pressed steel or angle iron frames, also chain or shaft drive. Any wheel base up to 138 inch, and any height of wheels. **ALSO ALL KINDS OF BODIES** Wheels, Axles, Steering Devices, Springs, Etc.



Write for our new Catalogue at once.

BORBEIN AUTO CO.,
2109 & 2111 N. 9th St.,
ST. LOUIS, MO.

13-22" Sliding Extension Gap Lathe



This Lathe swings 18 1/4 in. over top bed, 22 1/2 in. thru gap, and the gap opens 18 in. wide.

The 5 1/2 ft. bed takes up to 64 in. between centers, while our 7 1/2 ft. machine takes 96 in. between centers when extended.

Just the thing for garage and repair work, and saves investing in a large expensive lathe.

The machine is built strong, rigid and accurate, and has all necessary accessories as shown.

Descriptive bulletin and price at your command.

Barnes Drill Co., Inc., 1907,

818 Chestnut St.,
Rockford, Ill., U. S. A.

Builders of the All Geared Drill.

"AUTOMOBILE AXLES"—FOR SALE:
About 200 complete sets automobile front and rear axles, brand new, suitable for 25 horse power car, 2500 lbs. weight. Must sell at once. Can be had for ridiculously low price. Blue prints and full particulars sent on application. Quality guaranteed. Sam H. Moore, 5046 Lakeside Ave., Cleveland, Ohio.

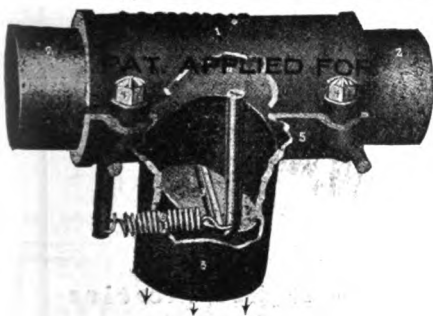
FOR SALE—Two-cylinder, 20 horse power, Beaver Motor, planetary transmission, radiator, hood and dash. Practically new. Will accept small two-cylinder motor for part payment. Salineville Model & Machine Works, Salineville, O.

FOR SALE—Stanley Steamer, folding back seat, 10 H., run about 5,000 miles, in fine condition. Over \$150.00 worth of extras. If interested write for particulars to "Schenectady." Care of the Automobile Dealer and Repairer, P. O. Box 654, New York.

ELECTRIC BRASS BUFFER—For Sale:
Similar to one advertised in this issue by Stow Manufacturing Co., Binghamton, and made by them. Used 3 times, 1/4 horse power motor, long flexible shaft. Will express it to first man sending me thirty-five dollars. Cost fifty. Ask banks here if I am reliable. Dr. Samuel C. Smith, Hollidaysburg, Pa.

The Stryker Muffler Cut-Out.

The value of a muffler cut-out principally depends on the amount of back pressure it will relieve. The outlet of the Stryker is as large in all sizes as the exhaust pipe, therefore it always relieves all the back pressure. Clean mufflers



The Stryker Muffler Cutout.

utilize a good deal of the power of your engine—clogged mufflers more. The Stryker is claimed to relieve 100 per cent. on all sizes, and increase the power of your engine, decreases carbon, keeps your engine from heating, saves oil and gasoline, and prolongs the life of your car. The Stryker is made of brass and put together in such a way that it will not work loose or break. It will not carbonize and is not affected by mud.

The Stryker Muffler Cut-out is manufactured by C. W. Stryker, Syracuse, N. Y., who will mail you a booklet on cut-outs upon request if you mention this journal.

Fuel and Ignition Cut Out



Saves about 20% of gasoline and batteries.

It gives instant control of your engine.

If your dealer does not handle them, write direct to factory.

Price list and circular sent on request.

MOLLER BROS.

Box 42 Lewistown, Pa.

THE FAMOUS Ronson Wrench \$1

At all Hardware and Accessory Stores

THE COLBY 40

(Develops Power of a "50")
A year ahead of them all in construction, value and price.

\$1750

Demountable Rims. Every part standard. Write for liberal proposition to dealers.
Colby Motor Co., Mason City, Ia.

Price, \$385 MOTORETTE



As well built as a \$6,000 automobile.

Send for Catalog B.

Dealers wanted.

Guaranteed for one year.

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HARTFORD, CONN., U. S. A.

ALUMINUM SOLDER THAT WILL SOLDER

Directions simple and easy to follow. Write for prices.

CLUM & ATKINSON

551 Lyall Avenue,

ROCHESTER, N. Y.

RUTENBER

MOTORS
Guaranteed for Life
All Sizes 14 Cylinder. Write for particulars.
Western Motor Co. Marion, Ind.

Subscribe to the "Automobile Dealer and Repairer," \$1.00 Per Year.

Handy Lamp GASOLINE LIGHTING SYSTEM



Draws Trade to Your Shop.

Gives a 300 Candle Power Shadowless Light the instant you move the lever. Turns up or down, like gas, burns dim when not in use, or can be turned up instantly when more light is needed. It floods a 30 foot space with a brilliancy like daylight. Far cheaper than gas, kerosene or electricity, and so simple that anyone can use it. You can depend on it for years for any purpose demanding a big, strong light. Catalogue A.P.R. tells why: Send for it now.

BRILLIANT GAS LAMP CO.

182 N. State Street (Dept. 28), Chicago, Ill.

Moore Tire Saving Jacks.—Many dealers and large numbers of car owners, no doubt, will be interested in the full-page announcement in this issue of J. C. Moore & Company, 306 Wisconsin street, Racine, Wis., giving full particulars of their "Tire Saving Jacks." These jacks take all the weight off the tires. They say when your machine is standing still and supporting a heavy load, it is wearing out, not as fast as it would on the road, but still wearing. It is claimed if the machine is jacked up when not in use that the tires will wear twice as long as they otherwise would. While this claim may be a little extravagant it is plain that if your car is supported by jacks the tires are relieved of all strain. The cost of a set of "Moore Tire Saving Jacks" is small as compared with the gain from having them. There is a coupon attached to the advertisement of this company which any reader can fill out and use.

Electric Lighting for Automobiles.—The Guide Motor Lamp Manufacturing Company of Cleveland, Ohio, would like to send to every reader of this paper their little booklet, which tells all about lighting your automobile with electricity, instead of gas or oil.

INSURE YOUR TIRES

A Tite-Wad outfit in your tool box will insure your return on the tires you started out with.

In the shop or on the road—with no tools but your two hands—large cuts and blow-outs, small holes and punctures in tube or casing may be immediately and permanently repaired with

"TITE-WAD"
TRADE MARK
"CAN'T TEAR IT OFF"
THE RUBBER PUTTY

Vulcanizing with heat rots rubber. Tite-Wad makes a vulcanized repair without heat.

Press a wad of Tite-Wad into the injury with your fingers and it becomes a part of the tire.

Fill up the small holes, blisters, rim-cuts, and worn places in the tread **now** before the tire is gone. This is the best tire insurance you can secure.

Tite-Wad is sold on an absolute guarantee of satisfaction or money refunded.

Price \$2.00, from your dealer, or direct from factory if he cannot supply you. Do not accept imitations or substitutes.

OUR PLAN FOR DEALERS

We have a dealer's proposition that will interest every live one.

In order to convince you that we have the livest proposition in this field and that you should put "TITE-WAD" in stock at once, we will send you prepaid our regular outfit for \$1.50 on our iron-clad guarantee of satisfaction or money back.

PAGE-LESTER CO.

Dept. 3, Omaha Bldg.,

CHICAGO, ILL.

PAGE-LESTER CO.,

Dept. 3, Omaha Bldg., Chicago, Ill.

Please find inclosed \$2.00 for which send me one Tite-Wad Outfit on your guarantee of money back if I am not satisfied.

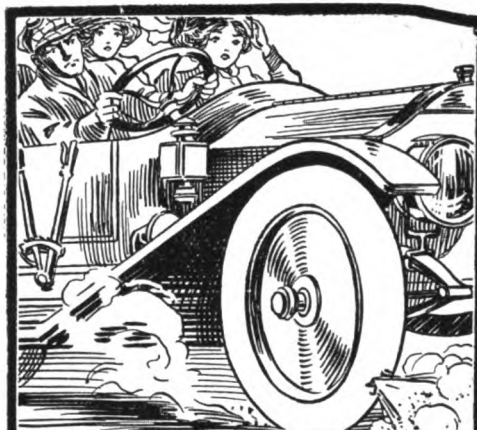
Dealer.....

Name.....

Address

If you are a dealer inclose your letter head.
If not, give us your dealer's name.

A PICTURE STORY WITH A MORAL



When you have a puncture or a blow-out on the road don't waste time in cussing.



Remove the tire and clean around the puncture. Apply cement.



Press a little "TITE-WAD," the rubber putty, into the hole with your fingers.



Replace the tire and you are on your way again with only a few minutes lost.

MORAL: Keep a "TITE-WAD" outfit in your tool box.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

SPLITDORF

COMMON SENSE PLUGS



have every quality that a superior plug should possess.

That's why they have always maintained their great popularity.

We have positive record of these Plugs which have been in constant use for seven years, and will give proof of same to anyone interested.

C. F. SPLITDORF

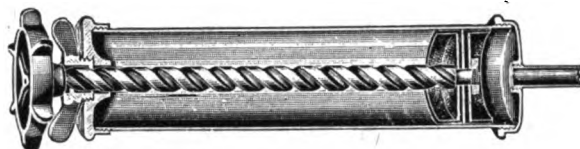
Walton Ave. and 138th St.

NEW YORK

Branch, 1679 Broadway

Miller Standard Grease Guns

QUICK OPERATING



PATENTED FEB. 7th, 1911

NOTE THE DOUBLE SPIRAL WORM.

STRONG, QUICK, RELIABLE, NO WASTE.

Capacity, 8 Ounces. Filled and Emptied with Ten Turns of the Wrist. Most powerful gun yet produced. Quickest operating.

Grease Gun, \$2.00. Combination Gun, \$2.50

Fully Guaranteed. Lasts a lifetime.

Manufactured by

MILLER & STARR

1783 Broadway,

New York

AUTOLINE

TRADE MARK.



The Oil That Saves the Motor.

AUTOLINE is made from selected Highest Grade Pennsylvania Crude Oil, it is filtered through bone-charcoal, and it produces a minimum amount of carbon. A Trial will Prove it.

GREASE-JOURNAL COMPOUND-GRAPHITE GREASE
For Transmission and Gear Lubrication

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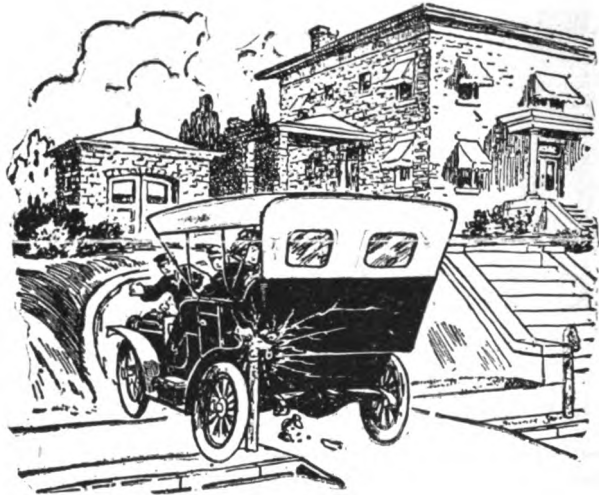
AUTOMOBILE AND AUTOMATIC

TURNTABLES

THE PUBLIC AND PRIVATE GARAGE SOLUTION

Mr. H. H. Root truly expressed the problem through his leading article in the April issue of the **AUTOMOBILE DEALER AND REPAIRER** when he said:

"Since the year 1903, when I began with a curved-dash Oldsmobile runabout, I have been running an automobile, but I have enjoyed the last year more than all the rest put together, principally because I had my own auto-house. One who has always kept his machine in a public garage, or in a building not especially adapted for the housing of an automobile, has no idea what solid comfort there is in a room especially designed for the purpose. Barns, sheds and the like are very poor places for automobiles, for the dust that collects is bad and the lack of room, as well as lack of suitable places for tools and paraphernalia, brings about, in the end, a great deal of inconvenience.



In considering the building of an auto-house, I made up my mind from the very first that I wanted a TURNTABLE, for six or seven years' experience in backing down a long driveway or backing out of a shed and turning around, taught me the very great value of such a convenience, and so the building was designed in such a way as to accommodate a TURNTABLE for as large a machine as I ever expected to own. Twice, in backing out of a building, I collided with a wagon, and once my brother backed into a man, knocked him down and nearly ran over him. All this made me more desirous than ever of turning around before leaving the building."



WE SUPPLY ALL the steel work necessary to build the wood-floor Turntable suggested by Mr. Root, or where your garage floor is already in we can furnish our famous **PITLESS TURNTABLE** which can be set up in your garage absolutely **free of all installation expenses**, on any kind of floor within one hour's time.

FOR THE PUBLIC GARAGE we have just perfected a **TRAVELING PITLESS TURNTABLE** which promises to revolutionize present methods of storing and garaging a large number of motor cars with surprising ease and safety.

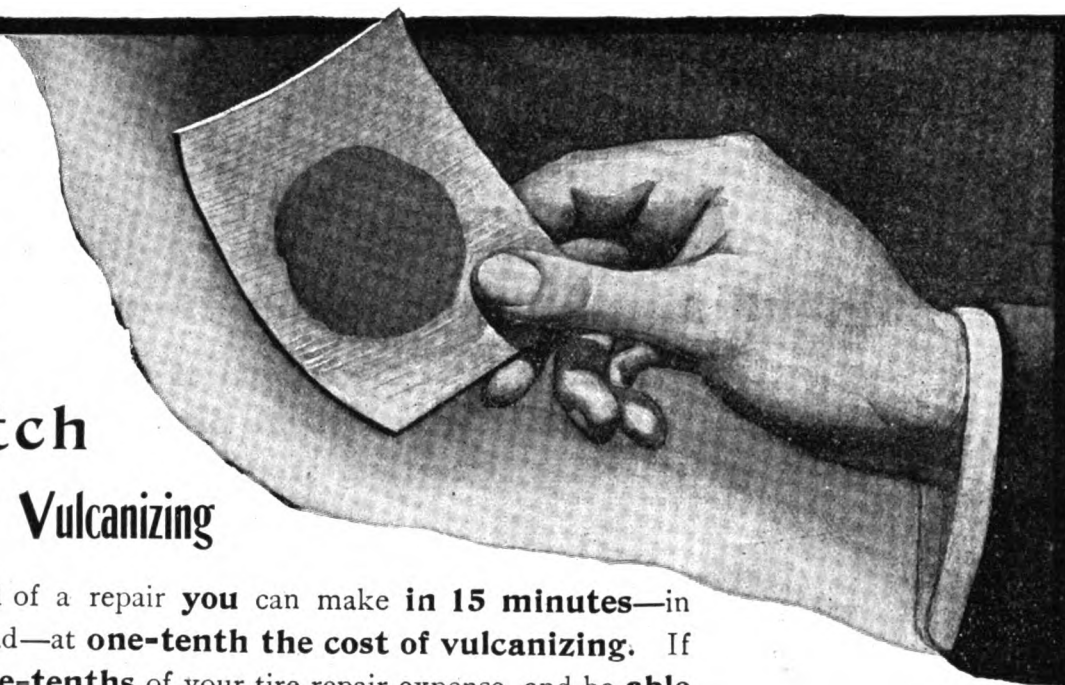
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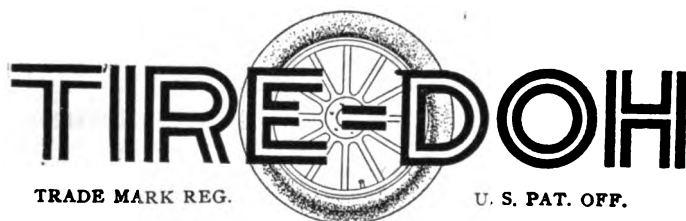


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Let us send you **FREE** This Patch Made Without Vulcanizing



It shows the kind of a repair **you** can make in **15 minutes**—in the shop or on the road—at **one-tenth the cost of vulcanizing**. If you want to save **nine-tenths** of your tire repair expense, and be **able** to repair your tires **on the road, without delay**, send us your name and address on a postal and get this **free** sample of what **you** can do with



Send **now** for this free patch so you can see with your **own eyes** that vulcanizing is a **useless extravagance**. Realize that you are just **wasting** money every time you repair your tires by vulcanizing; and you don't **get** any **more** for it. You can **test** this patch in **any** way you **want** and you will find it **as tough and elastic as the tire itself**. Remember Tire-Doh is **equally** effective for the **worst punctures or blow-outs, in tubes or casings**. If you care a "hang" for tire expense, send us your name and address on a postal and get this free patch.

FACTS ABOUT TIRE-DOH

Tire-Doh has been on the market just about a year and **over 80,000** outfits have been sold on our **guaranty of money back** if not **absolutely satisfactory** to the purchaser. Out of more than 30,000 only **22** have asked for money back.

Nearly a thousand auto supply dealers in every part of the United States are now **recommending** Tire-Doh **enthusiastically**. This new method of repairing tires has come to **stay** because it does **everything** that vulcanizing can do and at **one-tenth the cost**; and it does it **easier, quicker and better** no matter **where** you are when the repair has to be made.

By all means let us send you the free patch showing a repair made with Tire-Doh, and if you cannot get an outfit at your dealer's we will send you one direct, express prepaid, upon receipt of price, **\$2.00**, and return your money if you ask it.

AS A REMINDER TEAR OFF THIS COUPON NOW



This shows the Tire-Doh Outfit, price **\$2.00** everywhere. It consists of one can of Tire-Doh, one can of Tire-Doh Cement, and one Inside Casing Patch, all securely packed in a white enameled can. If your dealer cannot supply you just send this coupon to us and your check or money-order for **\$2.00** and we will ship you an outfit, express prepaid.

ATLAS AUTO SUPPLY CO., East Adams St., Chicago, Ill.

For this **\$2.00** please send me a Tire-Doh Outfit, express prepaid, upon condition that you will return my money in full upon request.

Name.....

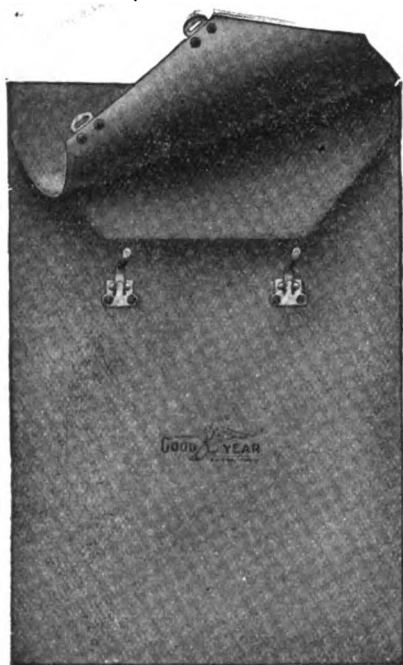
Address.....

If he had been able to supply me, I would have bought this outfit of my dealer.

.....
Please write your dealer's name here.

Don't Wear Out Extra Tubes Before They're Used

Quit carrying extra inner tubes in the bottom of the car, under the seat or in the tool box. There they become smeared with oil and grease and, as a result, rot. Sharp tools puncture them. Shuffling around wears them through.



Put the extra inner tubes in a Goodyear Inner Tube Bag. There they are safe from being punctured by tools; from rotting after being smeared with oil and grease, and from wearing through.

It is discouraging to put the last tube in the casing and find it punctured. Yet that predicament often happens to the motorist without a Goodyear Inner Tube Bag.

The bag is made from frictioned fabric which is water-proof and dirt-proof. The bag is large enough to carry three or four tubes, according to size. No grease nor oils can penetrate the bag.

The Inner Tube Bag is a big money-saver. The small investment will save the price of more than one tube.

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Dealers, Repair Men, Garage Men find that Goodyear accessories are producers of bigger business than any other line. This is due to the absolute satisfaction given by every article and by our tremendous advertising campaigns which have made these accessories known to every driver of an automobile. Write today to

The Goodyear Tire & Rubber Company

Sprague Street, AKRON, OHIO

Branches and Agencies in All the Principal Cities

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(1637)

The "High-Quality-Sane-Price" Car

The "high-quality sane-price" car briefly describes the Inter-State. We claim as do the operators of these cars, that in the Inter-State the greatest automobile value in America is given. The Inter-State with its medium price possesses characteristics and refinements of cars costing twice as much.

The splendid features of construction of the "40" models given below are merely a few of the Inter-State's most striking components. Our beautiful catalog gives the many other distinctive features. The catalog sent free upon request.

40 HORSE-POWER MODELS

A Few of Many Superior Points of Construction. Bore of Motor $4\frac{1}{2}$ in. Stroke 5 in.

1—This $\frac{1}{2}$ in. greater stroke gives more horse power for lighter weight motor. 2—Motor of longer life. 3—Greater economy of gasoline; 20 miles to the gallon under favorable road conditions. 4—Fine radiating surface. 5—Smoother running, less noise. 6—Reduced speed of action means reduced wear on bearings, valves, valve-stems, cams and crank shaft. 7—Longer stroke results in reduced temperature at exhaust valves; thus, valve-grinding is exceptional. 8—Increased compression and resultant economy of operation. 9—Better mixture and vaporizing of charge gives greater flexibility; the motor can be throttled down to lower speed and a steadier, more quiet and smooth pull on hills.

INTEGRAL CLUTCH AND GEARSET RUNS IN OIL

(Found only in a few of highest priced cars.)

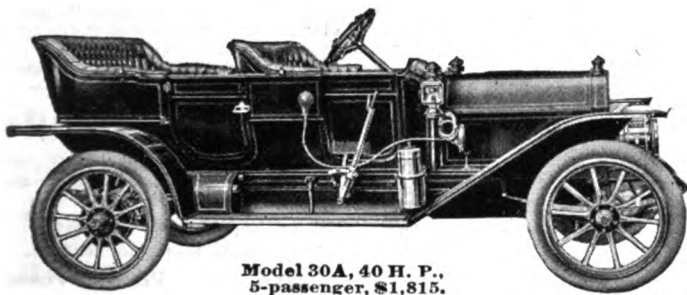
Greater rigidity and absence of friction—no loss of power, as clutch and gearset are of integral or unit design.

Power Transmission by Enclosed Propeller Shaft. Eliminates torsion bars and distance rods; no destructive sand or dust can work in crevices.

118-inch Wheel Base. 2 to 8 in. longer than in cars anywhere near price of Inter-State.

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Proper Distribution of Weight. 10,000 to 15,000 miles of service to original tires are result of car's lightness and even distribution of weight.



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5-passenger, \$1,815.
Special Equipment.

Inter-State Automobile Company

Dept. A. D. R. 5,

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BRANCHES:

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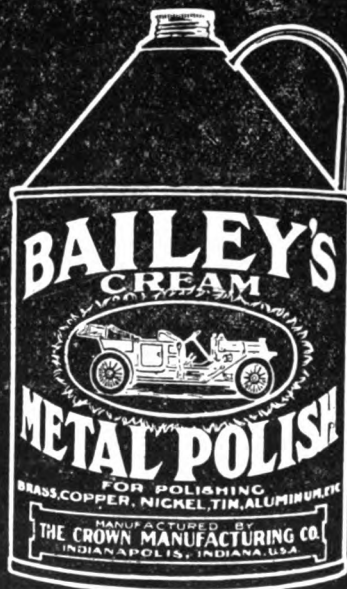
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Leaves no Sediment or Powder. Surpasses all other for Quick Action, Brilliancy and Lasting Lustre. Satisfaction Guaranteed or Money Refunded.

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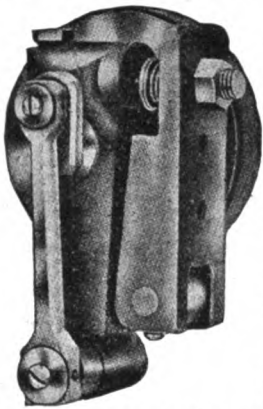
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Hart Giant Pump



This pump is positively guaranteed for one year free from any defects and will pump 90 lbs. of air into a shoe in three minutes.

Pressure gauge goes with it.

Weight of complete pump only 10 lbs.

We want the privilege of giving every reader of this paper full particulars concerning our pump.

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Noted for

**Accuracy, Durability
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Written guarantee for one year
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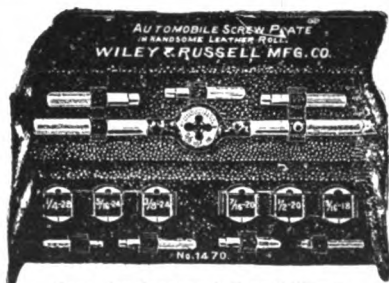
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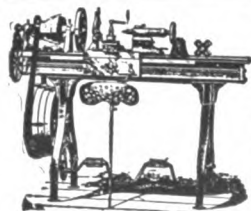
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Send for Catalog 34F and Prices.

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THE BARNES LATHES

9' swing
11' swing
13' swing

For Repair Work our No. 13 Lathe is right; has 13' swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with counter-shaft or foot-power.

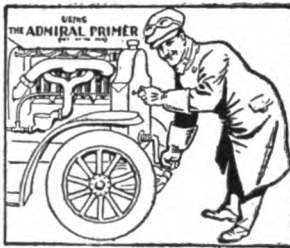
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(Patent applied for.)



This Instantaneous Engine Starter should be on every car.

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Automatic Water Regulator,
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Feed Water Heater,
Compound Steam Engines,
New Automatic Fuel Feed,
For all makes of steamers, including White's and Stanley's. Write for new Catalogue.

RHINELAND BEARINGS

Ball Bearings of high precision and strength.

A special stock for the repair trade.

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Price \$1.25

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THE PERFECT

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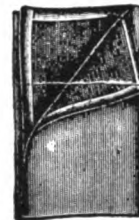
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Fire, water and moth proof—Manaline—greatest production of the age.
30 oz. Wool Kersey Back, Manaline facing.

Price, 50x60, each, \$2.50.

50x72, " 3.50.

Terms—No. 1, Check with order.
No. 2, C.O.D., subject to inspection.
No. 3, Customers with credit standing, regular terms.

The Western Robe Mills, 24 Peak Ct., Chicago, Ill.

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The buggy your fathers used with the mechanism your sons will use.

None so simple and sure.

Write to-day for leaflets.

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ON YOUR AUTO SUPPLIES.

We Undersell All Competitors.

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Automobile, Motor Boat, Motorcycle or Stationary

Tearing an engine to pieces and scraping out the carbon is slow, hard work, and likely to do more harm than good.

Prest-O-Carbon Remover, injected in the cylinder, loosens and removes all carbon from cylinder walls, piston, piston rings and valves. Cleans a cylinder perfectly in an hour for 25 cents or less. Increases compression, power and durability. Has no effect whatever on metal—cannot injure the engine in any way. We guarantee this. Easy to use—directions on can. Or your garage will use it for you—usual charge is \$3.

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251 E. South St., Indianapolis, Ind.

(Makers of Prest-O-Lite Gas Tanks)



All You Need to Repair the Worst Puncture



And do it instantly—for M. & M. Cement is instantaneous—positive—and self-vulcanizing. No waiting—steam and electric vulcanizing is old-fashioned and too slow for repairing punctures.

M. & M. is easy to use—on the road or in the garage.

Let us prove to you that M. & M. has qualities peculiar to itself—one of which is that of satisfying users.

M. & M. costs no more than uncertain brands, and will repair punctures quicker and better than the so-called "Just as Good" variety, and you take no chances of injuring the tubes.

We certainly feel proud of the fact that we have imitators—for the best is always imitated.

The Superiority of M. & M. has made it the Standard Brand to the motorist.

It has—and always will give those satisfying results.

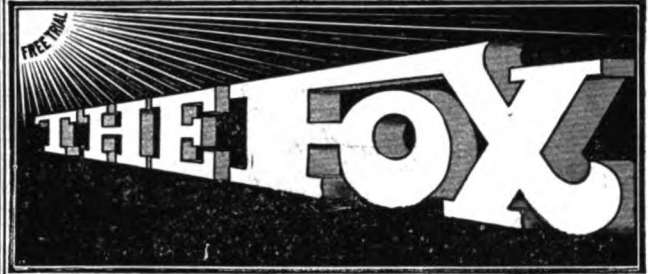
Insist upon M. & M. the next time you are in need.

Sold by all jobbers and most dealers, or if your dealer does not handle it, sent direct, express prepaid.

MANUFACTURED BY

THE M. & M. MFG. CO., Akron, Ohio.

P. S.—We are manufacturers of the famous *Knead-It*, for filling up those dig-outs in your casings—*It stays put*. 50 cents a can.



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If you knew positively that by the persistent and judicious use of a typewriter you could in 1911 **double your last year's business** you wouldn't hesitate an instant in purchasing one!

We have just issued a large illustrated book showing how the big city concerns have built up their immense businesses and shows how **anyone in any class of business** can increase that business by means of the typewriter. There are hundreds—yes, thousands—of persons in your territory who are interested in Automobiles, and Automobile Supplies and Repairs, and these parties are going to purchase **somewhere**. Why not send to-day for this book and let me show you how the typewriter will enable you to get this business? **It is Free!**

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SHOWING HOW
YOU CAN

Double
Your Sales
WITH A
TYPEWRITER



THE FOX—"THE ONE PERFECT VISIBLE TYPEWRITER"—FOR 20 CENTS A DAY! Sent on **FREE TRIAL** to anyone—anywhere—at my expense—to be returned if not better than the best of other makes. If purchased you can pay me a little down after trial and the balance at the rate of 20 cents a day—no payments on Sundays and Holidays.

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SEND FOR MY CATALOG, ANYWAY!

Date.....191.....

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6606-6616 Front Street, Grand Rapids, Mich.

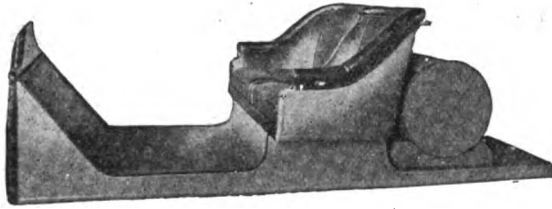
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Please send me a copy of your catalog and write me full particulars concerning your "20 cents a day" payment plan on the new Fox Visible Typewriter. It is distinctly understood that the signing of this coupon does not in any way obligate me to purchase, and that no typewriter is to be sent me unless I decide later to order one for free trial.

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SEATS
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Buick
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GUARANTEED PROMPT DELIVERIES

GRAND HAVEN AUTO BODY CO., Grand Haven, Mich.



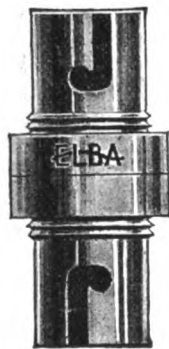
Electric fitting
installed in a square
side lamp.

Lamps cannot work
loose in this socket
because they are *locked*
in place by plungers,
controlled by strong
springs.

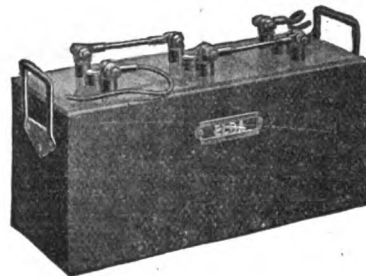
NO man would be without the convenience and cleanliness of electric lights in side and tail lights if he knew how easily the fittings are put into the lamps, how inexpensive the material is and how satisfactory when in service.

The ELBA fitting does not interfere with the lamp being used as an oil lamp, thus providing two entirely separate and independent methods of lighting.

A special ELBA Lighting Battery is furnished for this service.



TYPE U
Actual Size

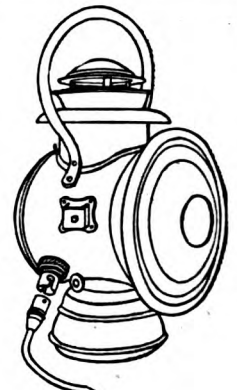


LIGHTING BATTERY

Ask Dept. A for Bulletins No. 24
and No. 27.



TYPE V
Actual Size



Electric fitting
installed in a lantern
type side lamp.

Type "U" in side
and tail lights can be
adjusted to any de-
sired height. Type
"V" attachment plug
completes the fitting.

Specify the ELBA Electric Lighting System on your new car.

The Willard Storage Battery Co., Cleveland, Ohio

NEW YORK, 136 West 52nd St.

DETROIT, 227 Jefferson St.

CHICAGO, 43 S. Dearborn St.

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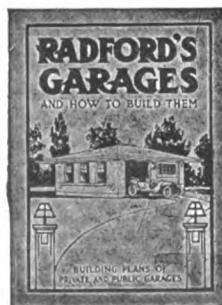
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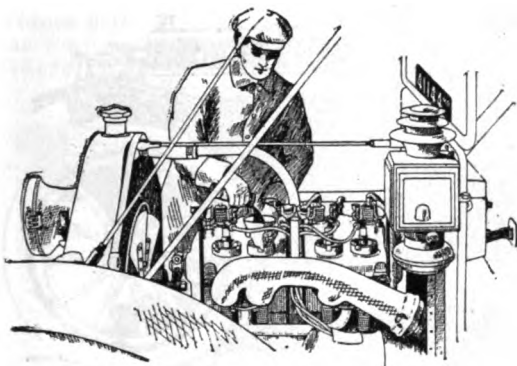
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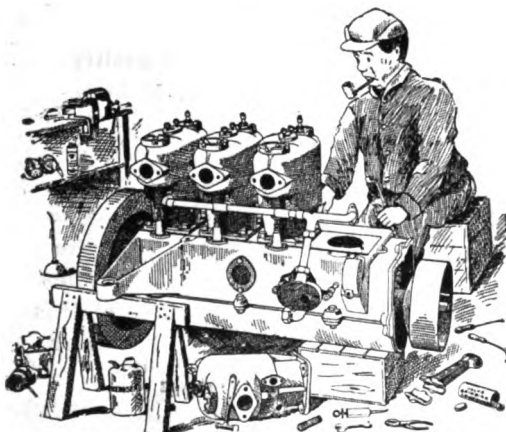
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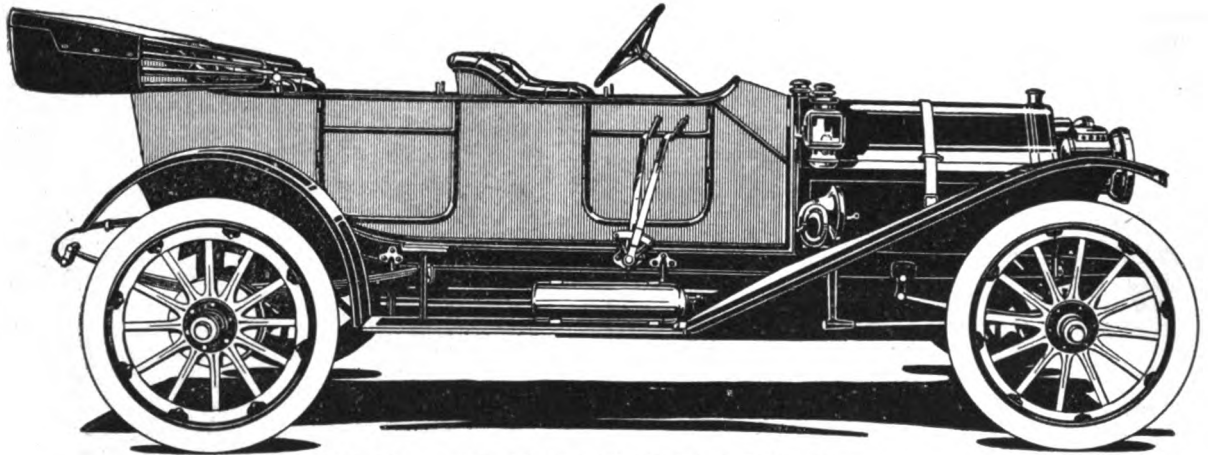
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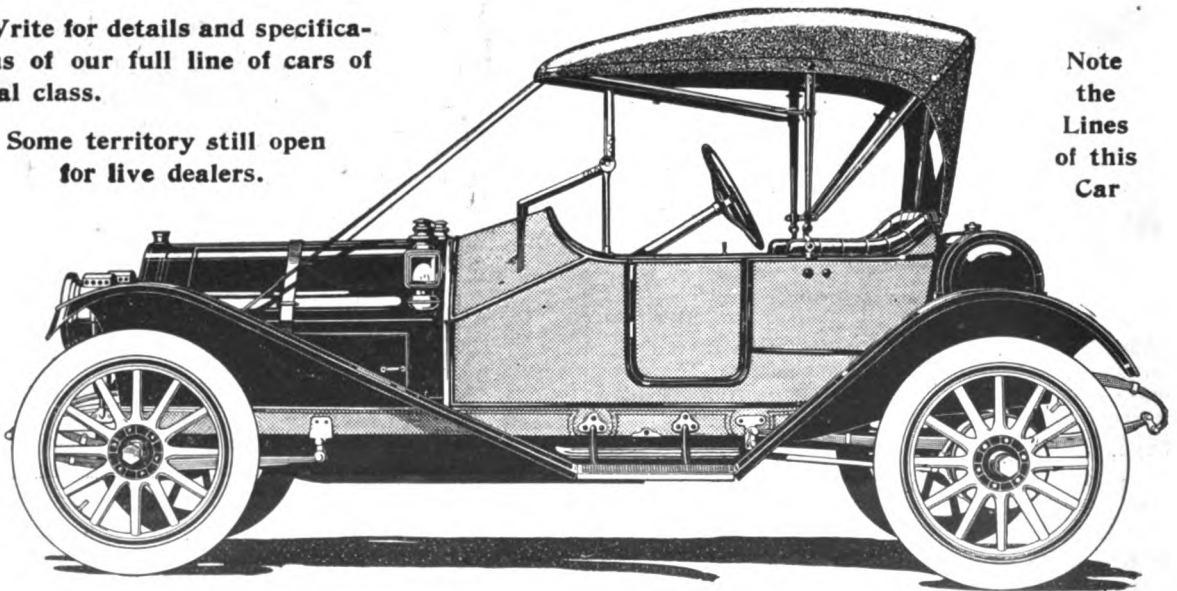
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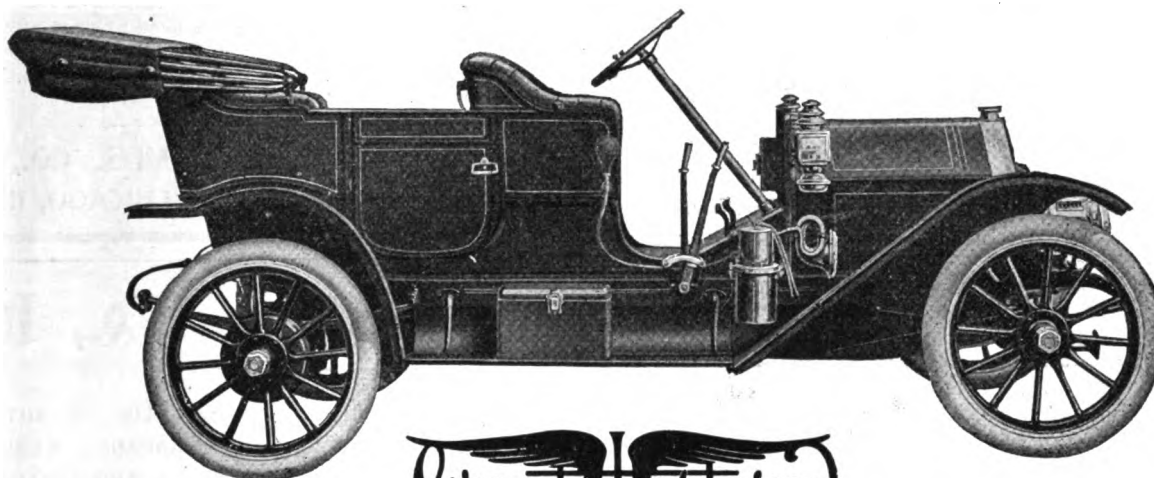
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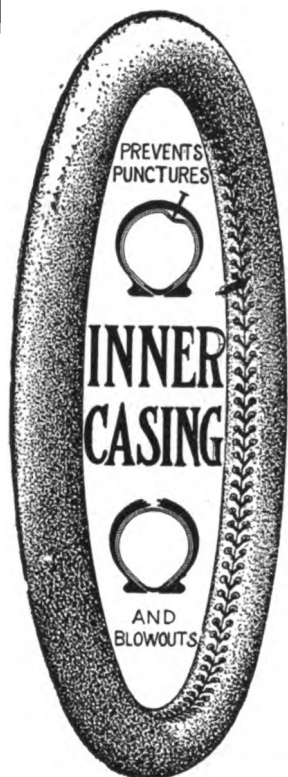
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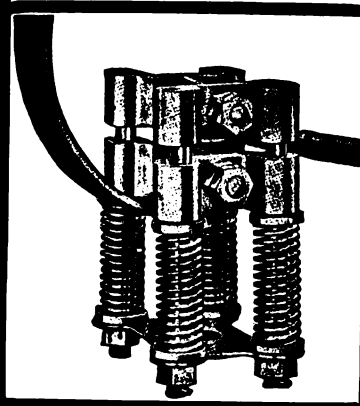
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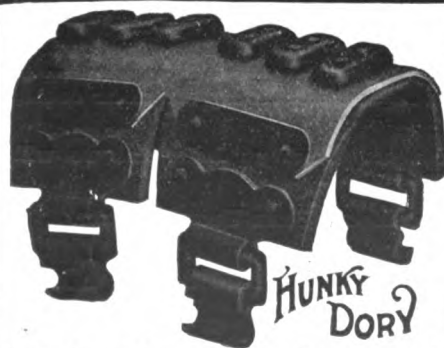
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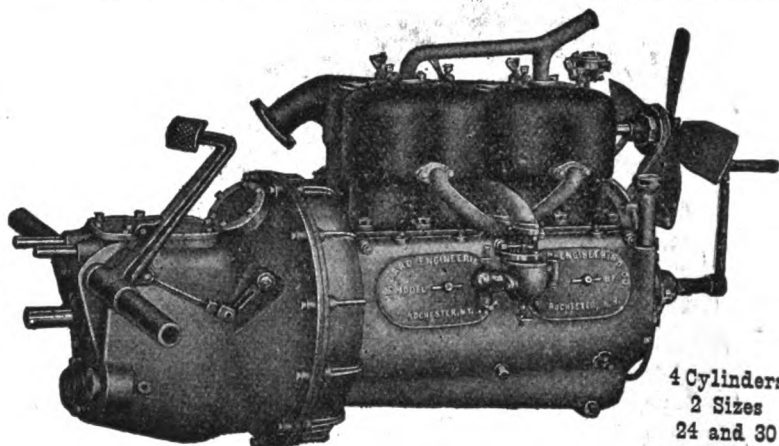
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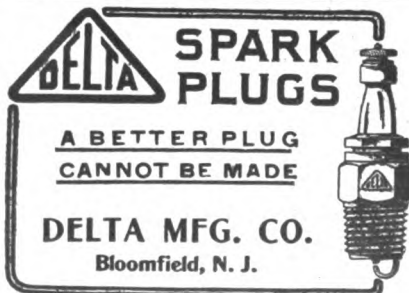
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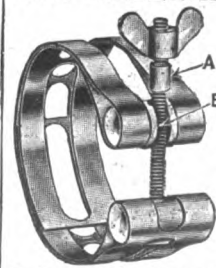


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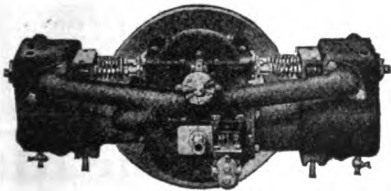


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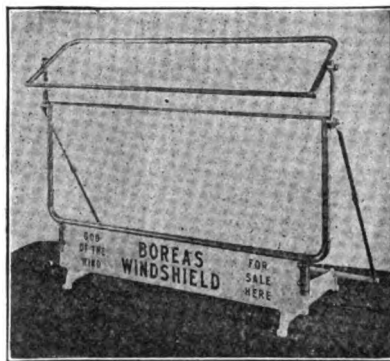
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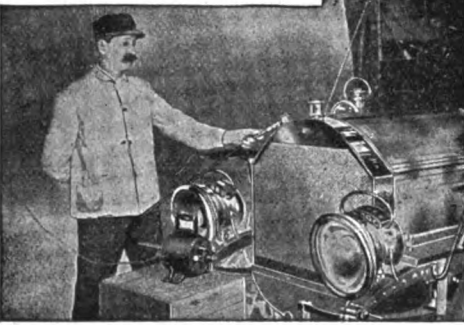
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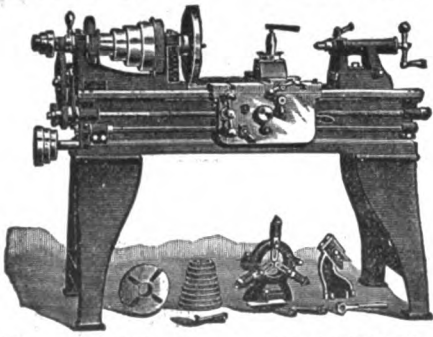
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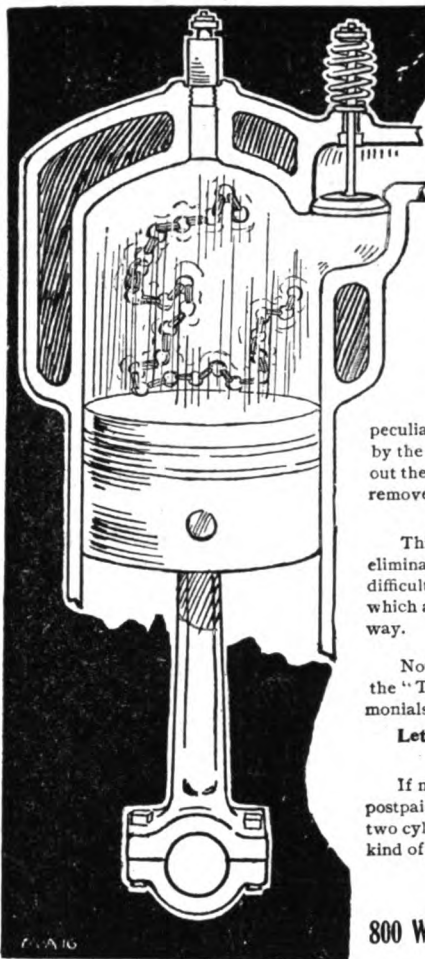
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This carbon remover is a small flexible coil chain, made of tough soft wire manufactured especially for this device; is as flexible as a piece of twine and absolutely harmless to the motor.

* * *

It is inserted into the cylinder through the spark plug hole, a little kerosene is injected at the same time, then the spark plug is replaced and disconnected from the ignition circuit, the motor is then run about two minutes at a medium rate of speed from power developed by the remaining cylinders. The peculiar construction of this carbon remover when thrown about by the moving piston, loosens the hard dry scale and it is blown out the exhaust. When the cylinder is clean the chain is easily removed by a special hook for the purpose.

* * *

This device saves the expense of tearing down the motor, eliminates disturbing the bearings and adjustments which are difficult to secure again. Does not scratch or nick the cylinders which a sharp edge tool is liable to do in the old "hand-scraping" way.

* * *

Not recommended for horizontal motors, Cadillac or some of the "T" type motors like Maxwell. We have hundreds of testimonials from owners of nearly all kinds of motors.

Let us send you our booklet of testimonials.

* * *

If not sold by your dealer, let us send you one by return mail, postpaid, for 75 CENTS OR THREE FOR \$2. (You can clean two cylinders at the same time with two chains.) Always state kind of motor as chains are made different sizes.

E. S. MICHENER,

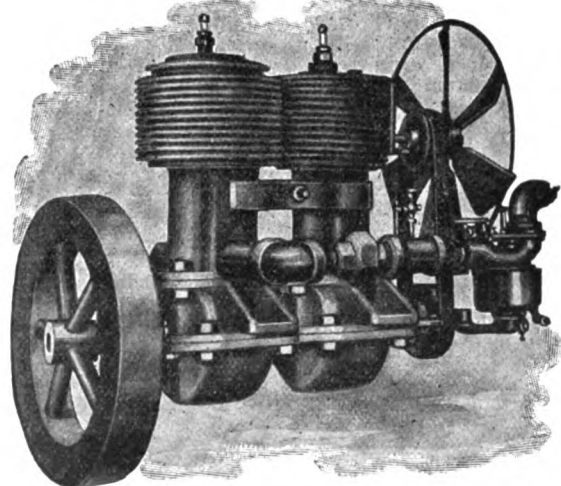
800 Washington Street,

NEW CASTLE, PA.

THE CLIMAX TWO CYCLE ENGINES ARE WORTH INVESTIGATING

No matter how good your power plant, we can improve it

*Safe
Simple
Reliable
Economical*



10-12 H. P. Air Cooled Motor. Weight, 138 lbs.

More reliable than a four cycle engine. Surer to go and quieter. And the price! We can astonish you and help you to meet all competitors.

Free catalog and liberal discounts to manufacturers
Write to-day for their history and prices

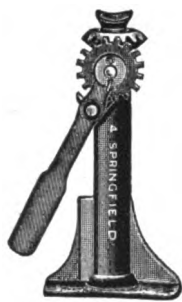
CLIMAX ELECTRIC WORKS

New Salem, Mass.

THE SPRINGFIELD JACKS, TIRE TOOLS, TIRE PUMPS, PLUG WRENCHES, Etc.



No. 0. Price, \$1.00



No. 4. Price, \$2.00



No. 3. Price, \$3.00

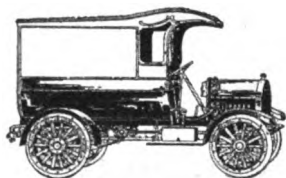
We manufacture Jacks of all descriptions having capacities of from 1000 to 2000 pounds.

WRITE US FOR DEALERS' PRICES
THE SHAWVER COMPANY, Springfield, Ohio



Write Today

For Catalog



1500 Pound Delivery Wagon

describing Victor Trucks, 1 1-2, 2 1-2, 3 1-2 and 5 tons capacity, 1500 pound Delivery Wagons, Ambulances, Police Patrols, Fire Trucks and Sight Seeing Cars.

VICTOR MOTOR TRUCK COMPANY

1450 Niagara St., Buffalo, N. Y.

The POSITIVE Lock Washer

Made in all sizes and weights for Automobile purposes. Can be used thinner than any other lock washer—effective, no matter how thin. One lock under the nut and head can be used if so desired. Exhaustive tests, covering a period of nearly 18 years on railroad track, drop presses, Automobiles and machinery subject to vibration, have proven its superiority over every nut lock manufactured. Write for samples and price. Made exclusively by the

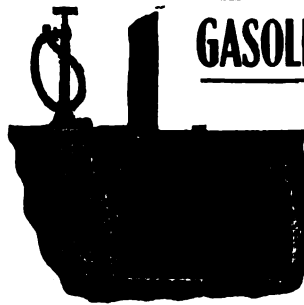
POSITIVE LOCK WASHER CO., Newark, N. J.

All others are imitations.

HANG ON TO YOUR OLD TIRES
THEY CAN BE USED FOREVER
WHEN COVERED WITH
STEEL

The Kimball Steel Protector makes Blow-outs, Punctures and Rim Cuts impossible. A few sections will hold any old blowout. Tires are as flexible as ever. Send for detailed information.
KIMBALL TIRE CASE CO., 174 Broadway, Council Bluffs, Iowa

GASOLINE STORAGE OUTFITS



WITH
WELDED-SEAMLESS TANKS
FOR
PUBLIC AND PRIVATE GARAGES
QUICK SELLERS, BIG PROFITS
AGENTS WANTED EVERYWHERE
NEW CATALOGUE READY

LEAKY TANKS ARE
DANGEROUS, SPECIFY
"J. S. CO." TANKS
FOR AUTOMOBILES
TRUCKS AND BOATS
ALL SIZES IN STOCK



**VANGUARD
BALL
BEARING
WIND
SHIELD**



**ABSOLUTELY
AUTOMATIC**

Any position desired can be obtained without stopping car. This shield operates with more ease than any other, as it operates on

BALL BEARINGS.

Send for discounts.

Zig-Zag, - List, \$30.00

Straight Shield, - 25.00

VANGUARD MFG. CO., Dept. G, Joliet, Ill.

Automobile Tops

WE are making some low prices on Mohair Tops for Touring Cars and Roadsters. We also manufacture some high class Zig Zag and Straight Wind Shields which we can sell at very low prices.

Write for catalog and prices before buying elsewhere.

LONDON AUTO SUPPLY CO.,
2544 Wabash Ave., Chicago, Ill.

Packard
CABLE

Cuts Out All Uncertainty

MR. OWNER: Put it on your car and forget your ignition cable troubles—you'll have enough left to avoid loneliness.

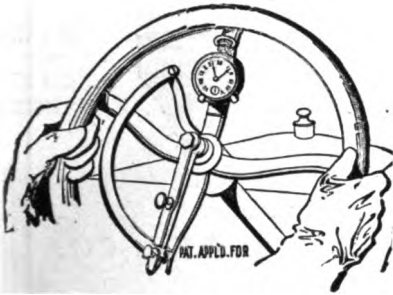
PACKARD CABLE lasts for years because it is effectually protected from heat, grease, oils and moisture.
FULLY GUARANTEED.

THE PACKARD ELECTRIC CO.
329 Dana Avenue WARREN, OHIO.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

TIME CLUTCH

Better Than a Clock.



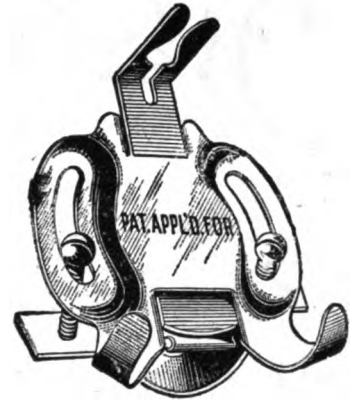
Any watch will fit this Attachment.
Places the time where you can see it.
Watch can be inserted or removed instantly.

**Nicely finished and Nickel Plated,
Post Paid, \$1.00.**

If your dealer cannot supply you, we will send
post paid on receipt of price.

THE STERLING MFG. CO., Inc.,

SUCCESSORS TO
H. L. LANG, STAUNTON, VA.



JUST WHAT YOU HAVE BEEN LOOKING FOR

**A STEAM Vulcanizer operated by Gasoline. The
Excelsior makes its own steam, no boiler required.**

Nothing but gasoline needed to produce the most perfect work
on inner tubes. Equipped complete with gasoline tank, pump, steam
gauge, pop valve, filling valve, drain cock, oil connections and our
famous quick acting clamps ready for use.

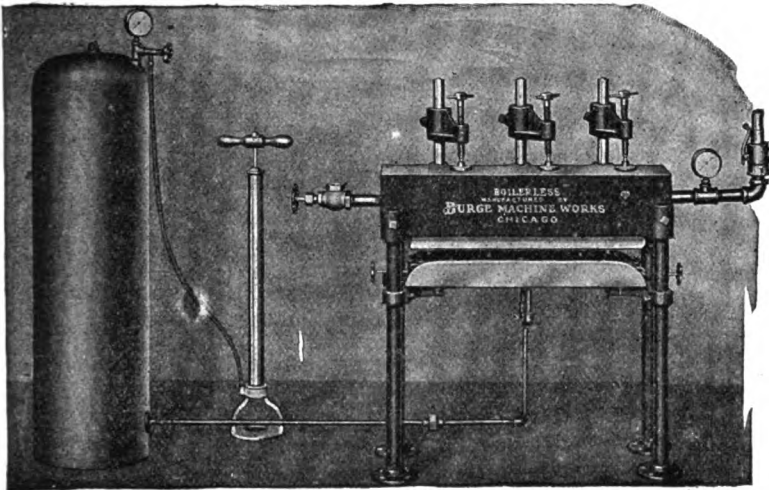
If gas is more convenient than gasoline, we furnish the outfit
arranged accordingly.

The Excelsior line of vulcanizing machinery is known from New
York to California, and from Minnesota to Texas; anyone who has
ever used an Excelsior Steel Retreading Kettle or Inner Tube Machine
knows that they turn out the very finest work and in the shortest
time, with the least amount of labor. Complete tire repair plants
including boiler, kettle, air compressor, buffing stand, air receiver,
motor, etc., etc. Write to-day for descriptive bulletins of the vul-
canizing outfit that the tire manufacturers use themselves and recom-
mend.

WISHART-BURGE MACHINE WORKS,

211-217 North Jefferson Street,

Chicago, Ill.



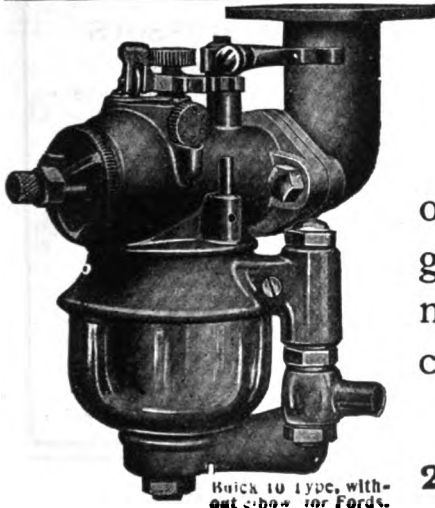
Special Heitger Carbureters for Small Cars

Made of Aluminum, nickel plated, heavy glass
or metal float bowls, separate adjustments for
gasoline, on high and low speeds, giving maxi-
mum speeds, fine control, minimum gasoline
consumption. Special types for Motorcycles also.

HEITGER CARBURETER CO.,

240 West So. St.,

Indianapolis, Ind.



Buick 10 type, with-
out elbow for Ford.

Empire Tires

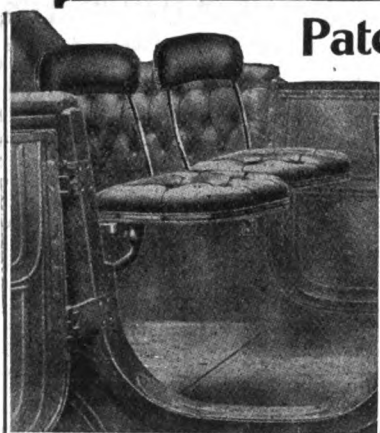
WEAR LONGEST

EMPIRE TIRE CO., Trenton, N.J.

Westen Says

- ¶ Shock Absorbers that affect the resiliency of your automobile springs are absolutely useless when you travel over smooth or ordinary roads.
- ¶ Most of your traveling is done on roads where shock absorbers are not necessary—then why sacrifice the easy riding qualities of your car by using the old-fashioned kind?
- ¶ **USE WESTEN SHOCK ABSORBERS**—remember they are guaranteed to take care of the bumps and still not make your car ride like a lumber-box on smooth roads. Think this over. Send for booklet. Three sizes—three prices.

WESTEN MANUFACTURING CO.
288 Halsey Street, Newark, N. J.



Patent Luxury Folding Seats

Made from steel drop forgings; artistic in design and finish; compact, rugged and durable.

A necessity of high grade car equipment.

Write for catalog showing various models.

Graves & Congdon Co.
AMESBURY, MASS.

Try Dixon's Motor Graphite

Just try it once and see how much easier, smoother and more quietly your car will run. Dixon's Graphite saves time and trouble. Write for free sample, G-184.

Joseph Dixon Crucible Company,
JERSEY CITY, N. J.

THE 2-3-2 or 3 A-C-C ENGINES

(2 Cycle Three-Cylinder 2 or 3 Port Air-Copper Cooling Engines)

Air Cooled 20-22 H.P.

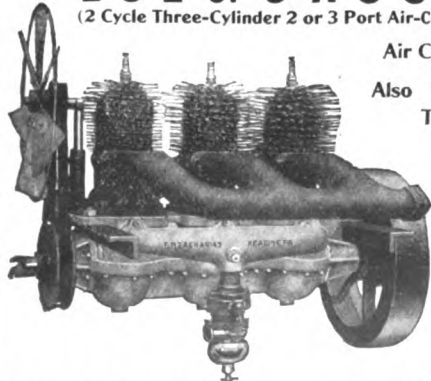
Also Made in One and Two Cylinders.

Construction is simple, durable, absolutely reliable, and smooth running.

All work thoroughly tested, and perfect satisfaction guaranteed.

Write for catalogue and information

E. H. ZACHARIAS, - - 121 Washington St., Reading, Pa.



DOVER AUTO FUNNELS

ARE THE STANDARD

56 Sizes and Styles



SEND FOR 1911 CATALOGUE.

DOVER STAMPING AND MFG. CO.
CAMBRIDGE, MASS.



THE INST LIGHTER

lights and controls the gas headlights from the driver's seat.

Can be mounted on the dash or on the heel-board.

THE ONLY SUCCESSFUL LIGHTER ON THE MARKET.

The spark is under absolute control of the operator.

NEW MODEL, with new indestructible burner clips, improved coil, tubing, wire, etc., **\$15.00.**

THE INST LIGHTER CO.,
55 E. Main St., COLUMBUS, O.

TO OPERATE:—Turn handle "A" and push "B"

Automatic Air Compressors

Motor or Line Shaft Drive

For Direct Tire Inflation or Storage Tank.

NEW AND VALUABLE FEATURES not found in other compressors.

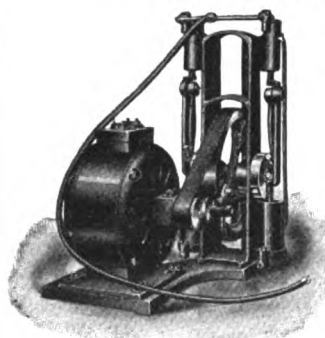
Used in the best Public and Private Garages, also in Auto and Tire Salesrooms.

We build a powerful Hand Lever Pump.

WRITE FOR BULLETIN

GLOBE MANUFACTURING COMPANY

BATTLE CREEK, MICH., U. S. A.



"STAR" LATHES

9 in., 11 in., 13 in. SWING.

Suitable for fine accurate work in the garage, repair shop, tool-room and machine shop.

Send for Catalog B.

THE SENECA FALLS MFG. CO.
429 Water Street, SENECA FALLS, N. Y.

A-1

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Some of Our Wearwell Specialties

Special Prices on Innerliners—Casings—Tubes



After being discarded as worthless, this tire was run 3000 miles.



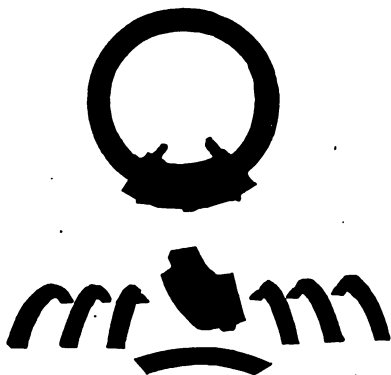
We make innerliners with or without interlocking flap, several weights, to fit any size or make of tire.



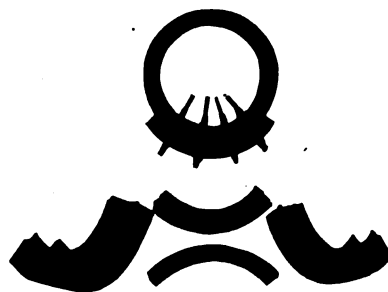
After being discarded as worthless, this tire was run 2500 miles.

Below is Our Complete Vulcanizing Outfit

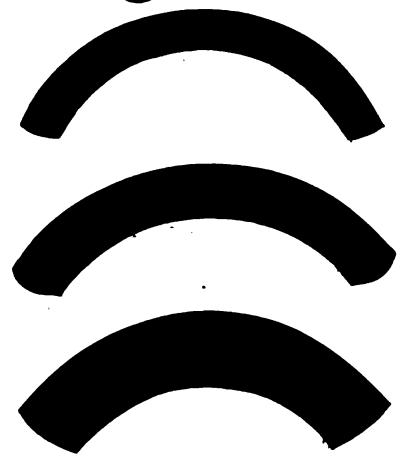
No Air Bags, No Sand Bags and Unlimited Pressure



SIDE MOLDS
For any size or make of casing.



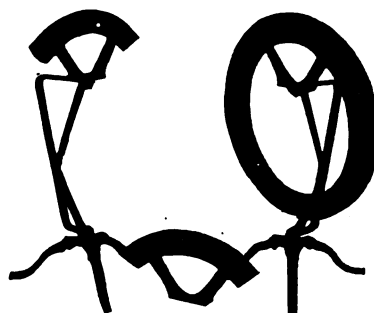
RE-TREAD MOLDS
For any size or make of casing.



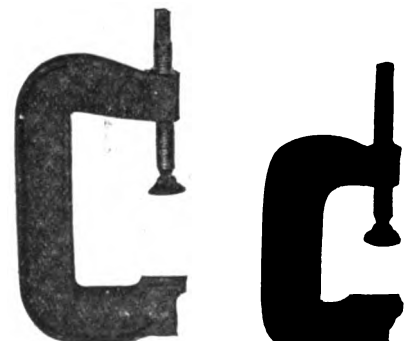
INSIDE MOLDS
For any size or make of casing.



TUBE PLATE OR PATCH
For any size or make of casing.



PORTABLE LAST AND STAND
Very convenient.



HEAVY RE-TREAD CLAMPS
2 sizes—1, 2.

The following are a few of the accessories we make: Raw Materials for Repairmen, Cements, Kettle Vulcanizers, Boilers, Mechanical Rubber Goods, Tube Repair Kits, Cement Patches, Lace Boots, Blowout Patches, Small Repair Vulcanizers, etc., and Specialties made to order.

Agents Wanted.

Special inducements to jobbers and dealers.

Write To-day for Illustrated Catalog

WEARWELL RUBBER CO., Kokomo, Ind. Branch Factory, Marion, Ind.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Triumph Leather Varnish Saves Your Auto Seats

**The Only Satisfactory
Leather Varnish Made
In The United States.**

When your Auto Seats and Tops begin to show signs of wear then is the time to get after them with Triumph Leather Varnish. Instead of washing your Seats and Tops, clean them from dust and dirt, apply a coat of Triumph Leather Varnish and you will be astonished at the results. If your Auto Seats and Tops are new, apply a coat of Leather Varnish, it will prolong the life, appearance and wear. If old and worn, it will bring back that new look.

Triumph Leather varnish preserves your Auto Seats and Tops, it will make them soft and pliable. It will not rub off, it will not crack or blister, it is a durable waterproof coating that stands the sun and rain. It contains no acid, and will not injure the leather.

It is guaranteed by the manufacturers.

Ask Your Auto Supply Dealer For Triumph Leather Varnish.

If he can't supply you, drop us a Postal and we will tell you where you can get it, or supply you directly.

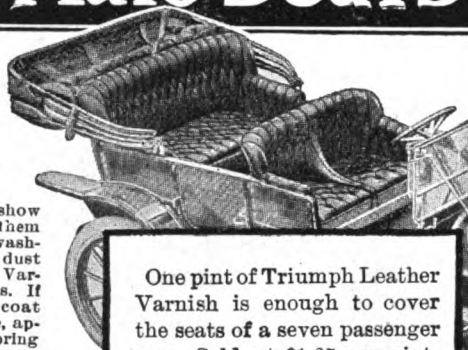
MANUFACTURED ONLY BY THE

NOVUS HOMO MFG. CO.

1340 Fond du Lac Ave.

Milwaukee, Wis.

TO DEALER AND JOBBERS—Write us for our prices and agent's proposition. We want live Auto Supply dealers to be well stocked. There is bound to be a demand for Triumph Leather Varnish.



One pint of Triumph Leather Varnish is enough to cover the seats of a seven passenger car. Sold at \$1.25 per pint. Apply with a soft ordinary brush, thin and evenly.



**HERE
IS THE CORK
To stop the Biggest
Leak in your Auto Budget**

IT SAVES TIRES

Let us tell you more about it

**TIRE SAVING CO.
RACINE
WIS.**

**Buckles on like your skates, no tools, no fussing, no cussing.
Stops Skidding and Punctures, is Dirt Proof, Cheap Mileage and a
Proven Economy.**



Improved Shippey Shock Absorber
prevents springs from breaking
and gives comfortable riding.
It has a perfect record of satis-
factory use.

Investigate by sending today for catalogue.

GEORGE E. SHIPPEY CO., Pittsfield, Mass.

Don't Use Two Sets of Plugs
—GET THE—

Superior Double Spark Plug
PRICE, \$1.50

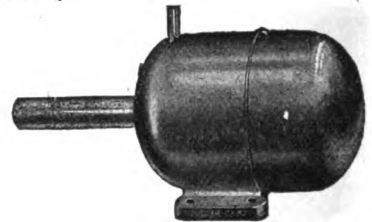
SUPERIOR MOTOR SPECIALTY COMPANY
44 North 4th Street, Philadelphia, Pa.

HOLTZER-CABOT VARIABLE SPEED DYNAMO

For Automobiles and Motor Boats

IN CONNECTION WITH THE
New Edison Storage Battery

Makes the best lighting system extant.
No relays or measuring instruments
necessary. Just the dynamo and
battery.



Send for New Booklet No. 581

The Holtzer-Cabot Elec. Co.

Brookline, Mass., and Chicago, Ill.

HOLT & BEEBEE CO.

Manufacturers
and
Repairers of

**Automobile
and
Carriage
Lamps**

Silver, Brass
and
Nickel Platers

40 Sudbury Street,
BOSTON, MASS.

Telephone,
1191 Haymarket

NORWOOD 3-in-1 VEHICLE CASTER JACK AND JACK ON WHEELS.

To lower, simply raise handle above the level. To raise, lower handle below the level.

Automobile can be moved while on the jack. Frame one piece malleable iron; ball bearing casters respond, permitting auto to be turned or moved easily in any direction.

Pat. June 25, 1907; Oct. 25, 1910. trade.

Write for descriptive circular

AUTO & ACCESSORIES MFG. CO.,
408 Continental Bldg., Baltimore, Md.

ATTENTION E-M-F OWNERS.

WE HAVE adjustment fixtures for
E-M-F push rods which make accurate ad-
justments and does away with noise and
rattle.

Autoparts Mfg. Co., Detroit, Mich.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

A.
S.
B.

TIRE PROTECTOR

*An Offer
to Car Owners*

If we have no agent in your city or town
handling the A. S. B. TIRE PROTECTOR
as a separate line, we will send you one

ABSOLUTELY FREE

*This offer is good only for
30 days from date of this issue.*

This offer is made in order to prove to you that the A. S. B. Tire Protector is the only mechanically **Perfect Tread** on the market; that it will give you longer service than the tire itself, and absolute freedom from puncture and blow-out—or other tire trouble.

The A. S. B. Tire Protector is the only tread that **always** runs evenly on the face of the tire.

The A. S. B. Tire Protector is guaranteed not to heat the casing or tube as the openings on the side give the air a chance to circulate and cool the tire. In fact a tire equipped with an A. S. B. Protector runs cooler than without one.

With the car equipped on all four wheels with the A. S. B. Tire Protector you can figure on from four to eight thousand miles without tire expense or trouble.

If you want our offer of one tread free, write at once for particulars.

Queen Manufacturing Co.

41 Seneca Street, WEBSTER CITY, Iowa

The New Service Bureau established by the United States Tire Company

Continental
G & J

Hartford
Morgan & Wright

How it will benefit you as a dealer

5,000,000 subscribers to the standard magazines will receive during the month of May the ad. reproduced on the opposite page, telling them of the new Service Bureau inaugurated by the United States Tire Company.

To every motorist in the country, this means increased tire mileage and decreased tire trouble and expense.

We intend to see to it that every user of United States Tires (also users of other brands, if they care to take advantage of our service) know how to get out of his tires every foot of mileage the maker has put into them.

What this means to every dealer:—

This plan of advising and helping the users of our tires in their proper handling means that every one of our dealers will sell to a customer not only United States Tires but also United States Service. They can guarantee to customers that our interest in them does not begin when they enter the store and end abruptly with the completion of the sale.

Every dealer or garage man knows that a large proportion of tire failures and the consequent customer dissatisfaction are not due to defective tires, but to the improper use of them.

The United States Tire Company have, by combining the brains, equipment and facilities of four great tire makers, succeeded in producing the longest lived, most

nearly trouble-proof tire it has ever been possible to build from a combination of rubber and fabric.

It is now extremely fitting that they should be the ones to take this other long step in advance—that they should assume the responsibility, heretofore shirked by most tire makers, of seeing to it that the service so carefully put into a tire is not wasted through misuse after the sale is made.

The resulting saving in tire expense to the motorist will mean a better business and a more permanent business for every United States dealer. It will mean that his business is built the way every dealer must build who expects to be in business ten years from now—on the solid foundation of CUSTOMER SATISFACTION.

United States Tire Company

BROADWAY AT 58TH STREET

- - - NEW YORK

Hundreds of motorists will receive and profit by the literature issued by our Service Bureau.

Over 5,000,000 Magazine subscribers will receive this message during May.



The United States Tire Company
has inaugurated a
Service Bureau
for the users of its tires—
Continental G & J Morgan & Wright Hartford

This Bureau will supply motorists with the most authoritative information obtainable concerning the best known methods of *increasing* tire mileage and *decreasing* tire trouble and cost. The tire manufacturer knows—just as dealers and garage men know—that where proper care is exercised in the use of tires there is a surprising reduction in the amount of the annual tire bill. *The United States Tire Company will see to it that this lack of care is not due to lack of information.* As the first step in the service which the Bureau will render its members, it has prepared and is ready to distribute the most exhaustive treatise on the care of tires that has ever been published. The practical, non-technical information contained in this book, together with the supplementary data that will be sent out by the Bureau from time to time, will, in hundreds of cases, result in an actual *saving of one-third in tire expense.*

This service will be unique in the history of Motor Tires and it is fitting that it should be inaugurated by a tire company that is unquestionably in a better position to-day through its five immense factories, its five laboratories and its exceptional equipment—to furnish the motorist *extra serviceable* tires, than is any other tire manufacturer in the world.

United States Tires are to-day America's Predominant Tires (selling at the same price asked for other kinds), and the inauguration of the Service Bureau is only another argument in their favor. **FILL OUT THE COUPON BELOW** and get the Initial Instruction Book and all subsequent information to be issued by the Bureau.

Please send all literature issued by your Service Bureau to

Name.....
Address.....
Make of Car.....
..... Tires.....

United States Tire Company, 1786 B'way, New York

A SUGGESTION
from the
Service Bureau

Soft tires are the greatest single cause of tire trouble as well as tire expense.

We ask the users of our tires to adhere to the table of pressures given below and thus increase mileage and reduce inconvenience and maintenance cost to a minimum.

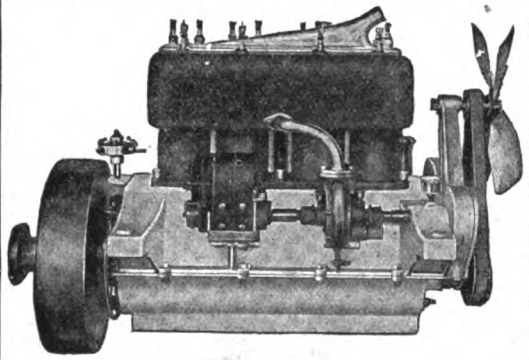
Required Air Pressure

2½ in. tires.....	50 lbs.
3 in. tires.....	60 lbs.
3½ in. tires.....	70 lbs.
4 in. tires.....	80 lbs.
4½ in. tires.....	90 lbs.
5 in. tires.....	100 lbs.
5½ in. tires.....	110 lbs.

Soft tires mean short mileage and plenty of trouble.

Cut this out
and mail
to-day



LONG STROKE, LARGE BEARINGS, LARGE VALVES

New Design of Block Motor

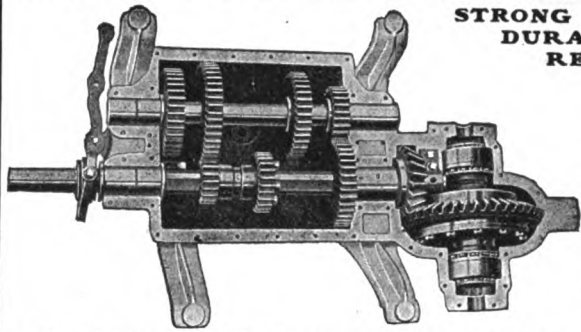
3 Bearing
Crank Shaft
Strong
Substantial
Reliable
and Smooth
Running

**BRENNAN
Motor Co.**
101 GRAPE ST.
SYRACUSE, N. Y.

Write us for
catalogue and
information.

SYRACUSE GEAR CO.

**STRONG
DURABLE
RELIABLE**



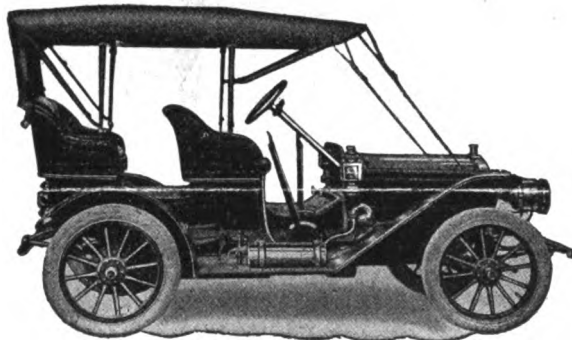
No. 5 Gears,
1½ in. face,
5 pitch.

No. 4 Gears,
1½ in. face,
6 pitch.

Fitted with
Equalizing
Gear for
double chain
drive.

Intended for the heaviest types of pleasure and commercial cars.
Also Planetary and Selective type transmissions.

SYRACUSE GEAR WORKS, 104 Grape Street, Syracuse, N. Y.



4 Bow Auto Style

AUTO TOPS

Mohair—Genuine material our specialty.

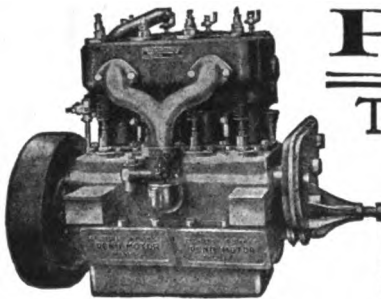
Our large production enables us to give greater values than any other top manufacturer.

Fit guaranteed on any make of car. We ship sudden.

Send for our catalog and money saving prices.
We can save you money no matter if you buy one or a hundred tops.

We sell Wind Shields—at a great saving to you.

WISCONSIN AUTO TOP CO.
Racine, Wis.

**PENN MOTORS**

THIS construction enables us to build the lightest, most compact and durable motor on the market.

Large Valve Areas and short lifts add to the power as well as the quiet running.

Crank-shafts of the suspended type.

Motors are equipped with a self-contained oiling system, and all parts are interchangeable and accessible.

Large Water Jackets, circulation being complete around cylinders, and valve chambers of sufficient area to make possible to run either by forced circulation or Thermo Syphon.

TWO TYPES { 20-24 H. P., 4-cyl., 3½-in. bore, 4½-in. stroke.
30-34 H. P., 4-cyl., 4½-in. bore, 4½-in. stroke.

Write at once for catalog giving full particulars.

Manufactured by CHESTER ENGINEERING & MACHINE COMPANY, Chester, Pa.

**Baldwin Chain and Mfg. Co.**

makes automobile chains both riveted and detachable—
all sizes in stock.

**SPROCKETS**

Sprockets made to order.

We carry in stock sprockets for the following cars:
Cadillac, Reo, Buick, Brush, and Chase Motor Truck.

Send for Quotations and Circulars

Baldwin Chain & Mfg. Co., Worcester, Mass.

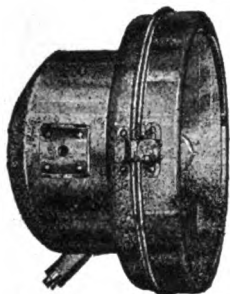
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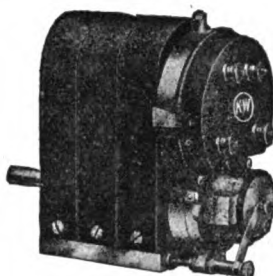


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Guaranteed to Start Engines up to 30 H.P.

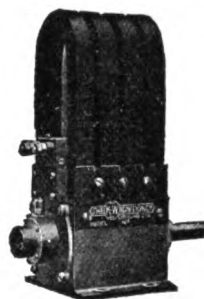


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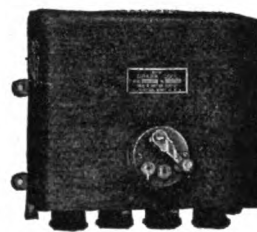
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Has its winding
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Our experience, extending over seven years, and the manufacture of over 75,000 protectors, together with our first-class manufacturing facilities, not only enables us to manufacture better protectors than the more inexperienced firms but also enables us to make protectors at a price that will average considerably cheaper.

WOODWORTH TREADS, on account of being made with treated leather which is not affected by water, are much more durable than protectors made of plain chrome leather such as is used by other makers. On account of being held with coil springs, they are always a perfect fit on the tire so that they not only consume less power but they never become loose to chafe and injure the tires. The rivets which we use are of our own design and not only give longer wear but hold better in the leather than the rivets ordinarily used.

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If you wish to feel safe against tire troubles, to have an anti-skid always in place and to reduce your running expenses, you should have a set of Woodworth Treads.

Sold by all first-class dealers, or shipped, express prepaid, from the factory.

Send for 1911 catalogs and booklet on the "Preservation of Tires."

Leather Tire Goods Company
NIAGARA FALLS, N. Y.





USERS of our
Tire Protectors
and Emergency
Patches say:

**"ONCE ON,
THEY ARE
THERE TO
STAY."**

**And There Are
Reasons A MAN-
UFACTURER of**

anything will contend that his goods are as
good, if not better better, than those offered
by his competitors. But a manufacturer's word is not the **last**
word. Let the buyers have **their** say—then you get **facts.**

Mr. E. A. Hurt, Agent for the G. C. & S. F. Railway, writes under date of July 25, 1910, as follows:

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Mr. Hurt has here told of the salient features concerning our Protectors as well as we could tell them. We have hundreds of other testimonials on file of the same tenor. Our goods are

Approved—Always—Everywhere

Our Emergency Patches are made of the same materials as the Protectors, and are attached in the same manner. These Patches positively have no equal. They are **firm** and **permanent**—not temporary.

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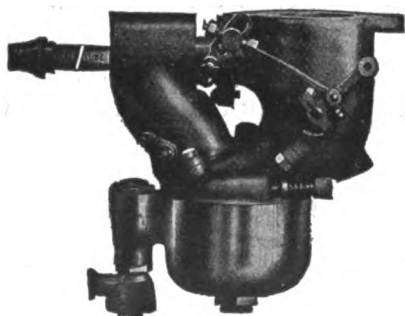
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Prevent your gas from condensing.
Prevent the necessity of rich mixtures.

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Missing, staggering, lack of flexibility
and extravagance of fuel.



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Ask any user.

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one for YOUR car,
if you will give the
name and model.

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I HAVE Solved the Problem of Perfect Tire Protection. My "Britcson" Guaranteed Detachable Tread Has stood the severest tests in actual use by thousands of automobile owners under all sorts of road conditions. I know this to be a fact, because, (1) I make the "Britcson" Tread in a manner that leaves no question of doubt as to its quality; (2) Hundreds of users of my tread all over the country have assured me that the "Britcson" is the one and only REAL Tire Protector.

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am now ready to place "Britcson" Agencies with leading dealers throughout the country. Applications will be considered in order of receipt. Live dealers, who want to represent the

Only REAL Tire Protector backed by the greatest advertising campaign ever undertaken on a similar proposition, should get busy and wire, write or phone for full particulars of my Britcson Tread proposition at once!

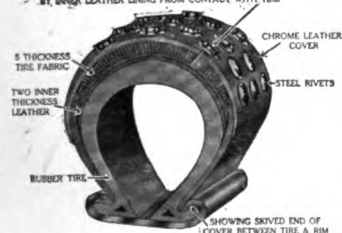
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"The Enemy Of Tire Expense"

Consider the following description of how this Tread is made:

First, I use an outer layer of specially tanned, extra pliable, Chrome Leather, which never becomes hard or brittle—never cracks—even when continuously exposed on the tire to all sorts of conditions—water, snow, sleet, dirt, etc. Next to the outer thickness of Chrome Leather are five layers—did you get that, "five layers"—of the very best quality tire fabric. I might use only three or four layers, and I might use a poorer quality of fabric, but my experience has proved that five layers are necessary to obtain perfect strength and in preventing the tread from stretching.

ROUGHENED STEEL STUD ALSO SHOWING CLINCHED ENDS PROTECTED BY INNER LEATHER LINING FROM CONTACT WITH TIRE



Cross Section of Britcson Tread

Next to these five layers of tire fabric is a layer of leather. Please note this: through the outer layer of Chrome Leather, then through the five layers of tire fabric are driven the steel studs and steel rivets. These are clinched into the layer of leather which immediately follows next to the tire fabric, and then there is yet another layer of leather which covers these clinched ends of rivets and studs and prevents them from coming in contact with the rubber tire. Consider, too, the method of fastening the Britcson Guaranteed Tread to the tire. The ends of the outer layer of Chrome Leather are

skived or sliced thin where they are placed between the rubber tire and rim. This does away with any possibility of thick ends which might crumple up, and makes possible a snug fit of the Britcson Tread over the rubber tire.

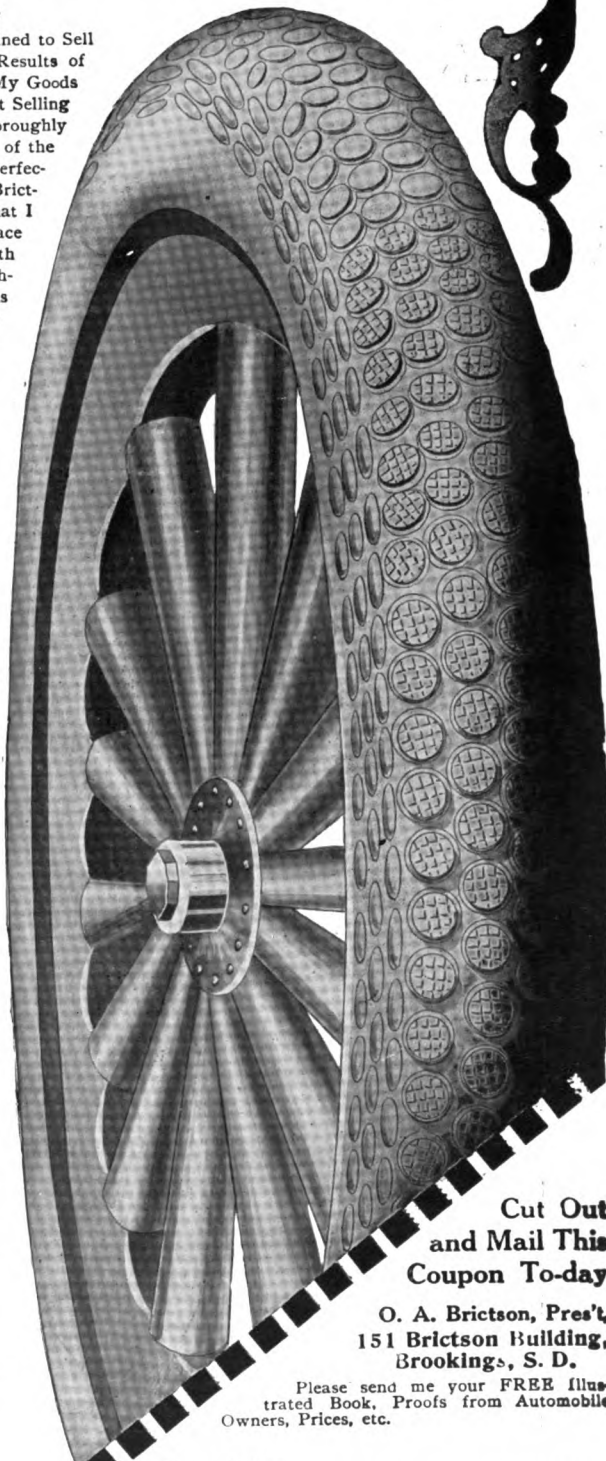
The Tread is slipped in place over the deflated tire and is not held to the tire or the rim by an artificial fastener, such as a hook, or buckle, a wire clasp, or anything of the sort. Air pressure between the tire and rim holds Tread to the tire after it is inflated. It is such construction as this that cuts your tire expense to a minimum.

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Britcson M'fg Co., 151 Britcson Bldg., Brookings, S. D.



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Name.....

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*—built on a new principle and offered
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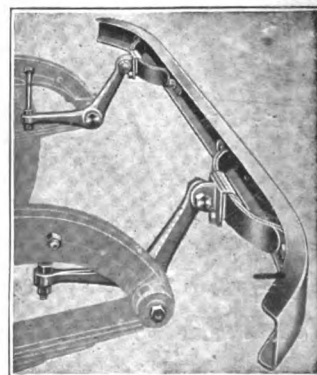
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If any part of the CONOVER SAFE-GUARD—defective or damaged through carelessness, collision or abuse—is returned within two years from date of factory tag, it will be replaced entirely free of charge.

This guarantee offers you more than good value. It goes beyond the device itself and guarantees you protection for your car whatever contingency may arise.

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Vol. 11. No. 4.

NEW YORK, JUNE, 1911.

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Do you realize what it means to the **DEALER** to display a **PANHARD OIL** sign?

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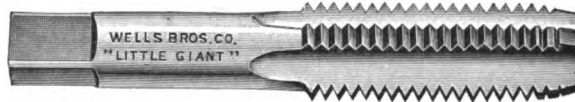
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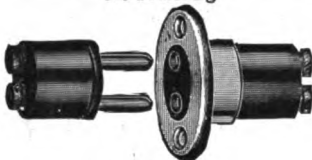
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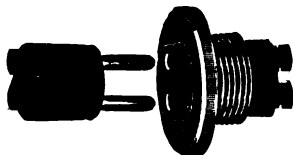
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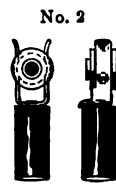
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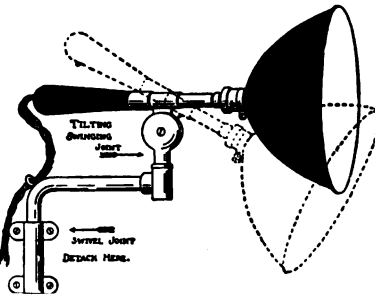
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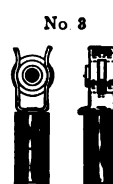
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The handle will swing in any position required, to dodge obstacles, making it possible to work in places where no other wrench can be used.

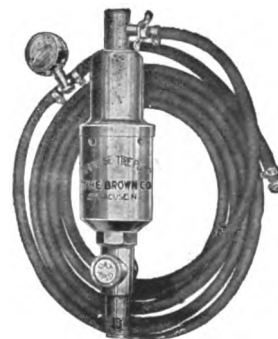
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SYRACUSE, N. Y.**

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Price, \$2.00 in knock-down form.

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"The Only" Blow-Out Patch.

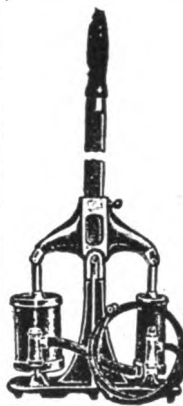


Made of vulcanized heavy tire fabric. Fits inside of outer casing perfectly. Flaps fit over rim and prevent creeping.

No.	Reg. Price	Cut Price
8100 For 2 1/4 or 3 in.		
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Rubber Tread



RUBBER TREAD is a high grade rubber compound in a plastic form for filling in cuts and dig-outs in Casings. It is easily applied with the fingers in a manner similar to putty and dries into a compound identical to the tire. It will save your tires, preventing sand pockets and blisters.

Prompt applications of RUBBER TREAD will prevent sand pockets and blisters which are so destructive to tires. Sand blisters are the forerunners of blowouts and a prevention of these mean less tire bills and considerably less trouble. RUBBER TREAD helps keep down the tire upkeep.

No.	Reg. Price	Cut Price
3311 Small can, each	\$0.50	\$0.30
3312 Large can, each	1.00	.55

By Mail Add 5 Cents Postage.

Only Pump Connection

This connection will fit any valve, as a perfectly air tight connection is made instantly by simply pushing it on over the valve.

No. 8715 Reg. Price \$0.50. Cut Price \$0.09
--

If by Mail Add 2 Cents Postage.



Hundreds of other bargains are pictured in the

"FREE NATIONAL AUTO SUPPLY" CATALOGUE

Take advantage of the great variety we offer. Write for this beautiful illustrated Catalogue at once. Write to-day, it is yours for the asking

NATIONAL AUTO SUPPLY CO.

Dept. B, 77 Chambers St.
 NEW YORK CITY

National Auto Supply Co., Dept. B, 77 Chambers Street, New York City.

Please send me the following articles as advertised for which I enclose \$.....

Name and Address.....

National Auto Supply Co., Dept. B, 77 Chambers Street, New York City.

Please send me by return mail your "Free National Auto Supply" Catalogue.

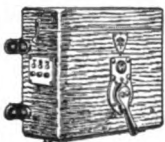
Name and Address.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Remy Magneto Light

(Electric Lights AND Dual Ignition)

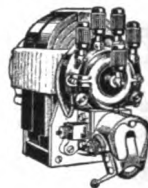
The First Magneto System That Supplies BOTH Electric Lights AND Ignition



COIL BOX

An inexhaustible source of current for all Lamps and all other electrical devices on the automobile.
Better Ignition, hottest spark at All speeds, never misses fire; AND the convenience, safety and style of electric lighting at lower cost.

A permanent supply of electric current, supplanting all make-shift devices. Self-charging; automatic. Nothing to do but press a button after original installation. Can be installed easily and quickly. Interchangeable with practically any magneto now in use.



MAGNETO

The Answer to a Tremendous Demand

THE Remy Electric Company, of Anderson, Indiana, the largest and one of the oldest manufacturers of ignition apparatus, announces the perfection of the first and only magneto system that supplies both electric current for lights and other electrical devices AND for dual ignition of a highly improved character. This revolutionary device is known as the "Remy Magneto Light."

It is placed on the market after years of laboratory development and months of exhaustive tests under the severest conditions of automobilism. Many motor car manufacturers assisted in this test, and they are unanimous in their praise for this new system.

When the car is running the MAGNETO FURNISHES BOTH ELECTRIC LIGHTS AND IGNITION AND CHARGES THE STORAGE BATTERY. When the car stops the storage battery automatically takes up the lighting load, without attention from the driver.

A simple electrical regulating device maintains the constant current, giving a steady, ever-dependable, non-flickering light that floods the road far ahead upon the pressure of a button located on the mahogany coil box. This system requires no attention or outlay from the car owner after installation.

NOTE THESE ADVANTAGES:

CONVENIENCE—You press a button—that's all. Do not leave the seat to light up.

SAFETY—A flood of brilliant, steady light sweeping the road far ahead means speed with safety at night on rough and unknown roads. No chance for light or ignition to fail when it is needed most. No open flames, and no insurance rules to watch. No explosions to fear.

ECONOMY—No more trips to the recharging station with an empty tank, at from two to five dollars per trip. No more flaring open flames to blacken, to burn or ruin good lamps. No more broken parts because you failed to see the treacherous bump or hole. No more recharging of batteries. No time wasted in looking for a recharging station.

The Remy Record

Bob Burman, the World's Speed King, eclipsed all existing speed records in the "Blitzen" Benz, equipped with a Remy Magneto, travelling at a pace of 141.83 miles per hour. Remy stands for endurance, reliability, constant service.

The Remy Service

Users of Remy equipment are given an unequalled service. Remy branches, travelling experts, reach everywhere. It will please YOU as it is pleasing hundreds of thousands of users of Remy devices now. Please write for complete information.

RELIABILITY—Your magneto is your charging plant. You are not relying upon a temporary supply, short-lived at best.

There is nothing to forget. Your magneto is always on the job. No chance to get stranded.

CLEANLINESS—STYLE—No open flame. No soot, no odor. Artistic lamp styles came AFTER electric lighting.

AND IMPROVED IGNITION

Due to the enormous primary current generated the Remy Magneto Light furnishes the hottest spark at all speeds. This means a more flexible motor, greater ease of operation in congested city traffic, or in meeting the inequalities of bad country roads. 1: means greater pulling power at low engine speeds.

The current is direct and constant. Hence the spark is of the same intense heat at all speeds. The timing range is unusually wide (70 degrees), giving all possible advantage of piston stroke.

Surest system for starting the car without cranking. A vibrator is used for starting only. Starting without cranking is possible as long as the cylinder holds the charge of gas.

Individual Yale lock is incorporated with each ignition kick-switch, eliminating danger of car theft.

LET US EQUIP YOUR CAR NOW

Let us install the Remy Magneto upon your car, NOW. When the advantages, the efficiency of this system are realized, no other equipment will begin to satisfy you. We can install it quickly and at a reasonable cost.

DEMAND IT ON YOUR NEW CAR

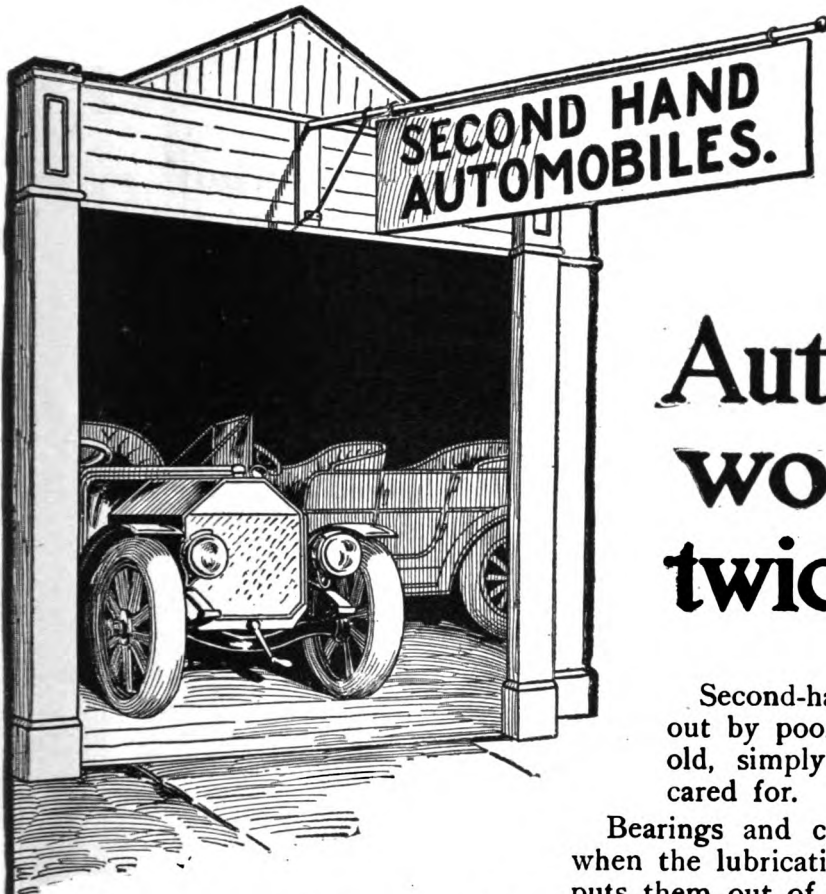
If you insist you will probably get Remy Magneto Light without additional cost. Makers of higher-priced cars will furnish this equipment. It means a better car, more service to the buyer, a happier customer.



REMY ELECTRIC CO.

FACTORIES · ANDERSON, INDIANA · GEN'L OFFICES
NEW YORK · BOSTON · DETROIT · CHICAGO · KANSAS CITY
SAN FRANCISCO





Automobiles would last twice as long

Second-hand lists are crowded with cars worn out by poor lubrication. They are prematurely old, simply because they were not properly cared for.

Bearings and cylinders and gears do not last long when the lubrication is faulty. Misuse—not miles—puts them out of commission.

If you would get the maximum service from your car, lubricate it with Keystone Grease and Keystone Motor Oil.

Keystone Motor Oil

Keystone Motor Oil is a cylinder oil of the same high standard as Keystone Grease. It is the only lubricant that will not deposit carbon under any cylinder heat, and that will not decompose or lose its necessary viscosity in any working condition.

Our Guarantee

One pound of Keystone Grease is equal to three or four pounds of any other grease or lubricating compound—or four to six gallons of any bearing oil.

Keystone Grease and Keystone Motor Oil can be bought from all dealers and garages—or direct from any of our branch offices.

Send for interesting lubricating literature—a liberal education on the subject.



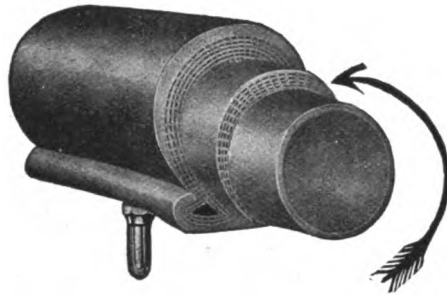
lubricates perfectly, does not become gummy, and holds its original consistency in all working temperatures. Cheaper because it wears longer and gives better service while it is wearing. For thirty years it has been recognized by expert engineers as the standard lubricant for all classes of fine machinery.

KEYSTONE LUBRICATING CO., Philadelphia, Pa.

Branch Offices and Warehouses:

New York—1777 Broadway.
Chicago—2123 Michigan Ave.
New Orleans—610-12 Chartres St.
Los Angeles—1607 S. Flower St.
Boston—284 to 290 Franklin St.
Columbus, O.—542 Vermont Place.
Denver—First National Bank Bldg.
San Francisco—268 Market St.

Philadelphia Store Auto Dept.—
1327 Race St.
Minneapolis—902 Lumber Exch.
Bldg.
Joplin—2131 Sergeant Ave.
Knoxville, Tenn.—707 W. Fifth Ave.

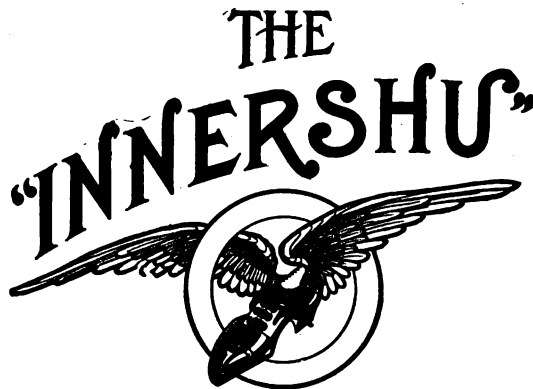


Made of **Bullet-Proof**

Sea Island Cotton Fabric, formed and stretched by our special **secret process** to **exactly** fit a tire so as to relieve it from all strain from within. Protects the tube. **DOUBLES** tire mileage. Is **blow-out** and **puncture proof**.

Easily placed and out of sight. Insures 75 per cent. decrease in tire troubles and expense.

**INSIST ON THIS
LABEL**



LABEL COPYRIGHT 1908
BY INNER SHOE TIRE CO.

PROTECTS Against Imitations
INSURES the Original and Only
"INNERSHU"
GIVES An Absolute GUARANTEE
To Produce Satisfactory Results
ASK YOUR DEALER

OR WRITE

INNER SHOE TIRE COMPANY
Grand Rapids, Mich. U. S. A.

Is Your Finger on the Pulse of the Automobile Situation

Perhaps this will point out a phase you have overlooked

What you are going to do next year is a thought that should now occupy much of your attention.

The advancement of an industry is shown by the wrecks of the companies who participate in its progress. This is true with all industries. Failures occur during the most prosperous times, just as they do during periods of panic.

In 1909, 446 clothing manufacturers, for instance, failed. This in prosperous times. The liabilities totaled \$4,826,047. Yet the big manufacturers grew. They were not affected. They felt no money stringency. They did not even feel the effect of severe competition. Their progress was made at the expense of the less competent—less successful makers.

That holds true with the automobile industry. Some manufacturers will continue to grow bigger. Theirs will be big lines. Companies manned by men of inexperience and insufficient capital, will be unable to survive. Even when the demand was great, there were many failures. But as competition becomes harder; as those successful makers develop their business and are able to eliminate wasted effort, it will be harder for the less competent. It is the same with men as with the industries.

We are not seeking new agency arrangements for HUDSON cars. Our entire product for 1911 is contracted for, but just as we constantly scan the industry for the most efficient men, whether they are testers, machinists, superintendents or managers, we are also just as watchful for dealers.

This advertisement is merely to suggest to you that you note what the HUDSON does this year. Perhaps you, too, would like to be identified with its organization. At any rate, a close observance of its progress indicates pretty thoroughly the advancement the industry is making.

HUDSON
MOTOR CAR CO.

7011 Jefferson Ave., Detroit, Michigan

53-C

The Largest Single Order ever given for automobile Tires and Rims has just been placed with the United States Tire Company by the Studebaker Cor- poration—Manufacturers of the popular E=M=F “30” and Flanders “20” Cars

The order calls for practically 135,000 tires and an equal number of Continental Demountable Rims—Gilbert type (Standard Universal Rim No. 3).

This single order **FOR TIRES ONLY** will amount to over **FOUR MILLION DOLLARS**. Never before has an automobile concern making cars in immense quantities contracted for a strictly high-grade tire for its entire output of cars.

The transaction is distinctly to the credit of both the Studebaker Corporation and the United States Tire Company—

To the former, because of its unwillingness to supply any but tires of proven quality on its cars, regardless of additional cost involved;

To the United States Tire Company because the selection of its tires in preference to all others was made after three years' experience with one of its four brands—Morgan & Wright.

It is of interest to note that three years ago the then E-M-F Company decided that the magneto was an essential part of every automobile, and ought, therefore, to be included in the price of the car. This policy undoubtedly cost the company thousands of dollars in possible profits, but it has resulted in having magnetos furnished without extra cost on practically all American cars.

By its present decision to use only Continental Demountable Rims as standard equipment, it is adopting another policy that is well-nigh revolutionary in the automobile business, as heretofore rims of this character have been confined to the highest-priced cars.

Three years ago the E-M-F Co. selected Morgan & Wright tires as standard equipment **WITHOUT OPTION ON OTHER BRANDS.**

These tires were selected, not because they could be had at a less price (which was not the case), but because the E-M-F Co. had demonstrated to their entire satisfaction that these tires were the most desirable tires to put on their cars.

The placing of the immense order referred to above is a flattering testimonial to the manner in which these tires have stood up on the E-M-F cars during these three years.

The Studebaker Corporation has selected United States Tires and Continental Rims because of their expressed belief that this equipment on their entire product gives both the dealer and the man who buys the car the BEST equipment the American tire market affords.

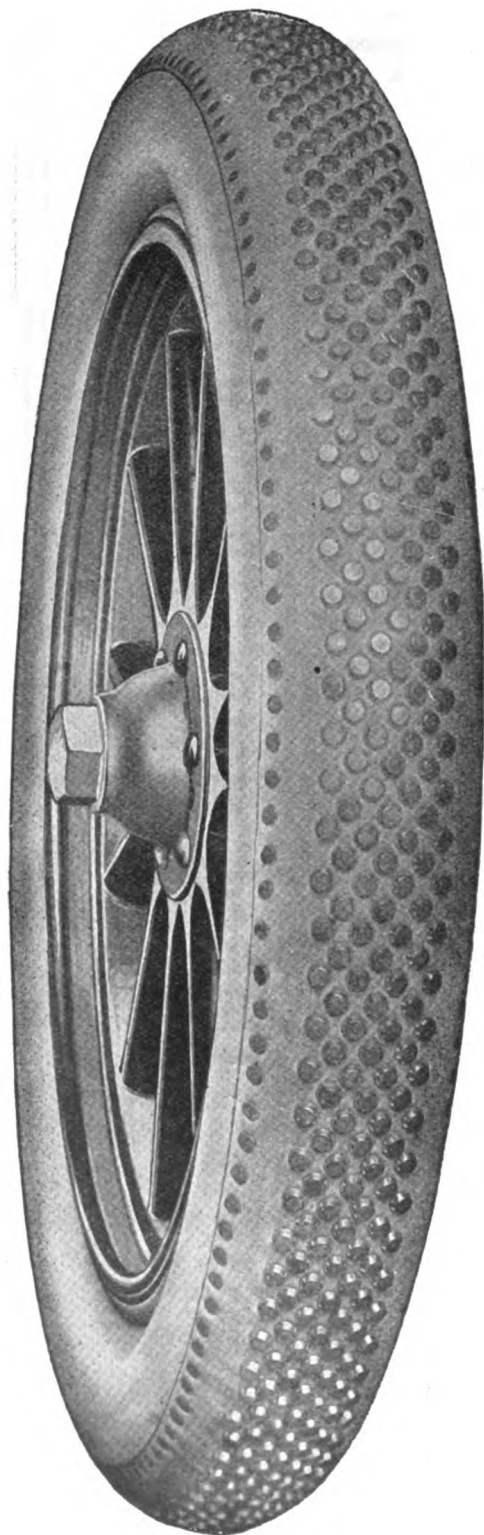
United States Tires are sold under four brand names: Continental, G & J, Hartford and Morgan & Wright, and are manufactured in five of the largest and best equipped tire plants in the world. Under the present system of manufacturing there is a **UNIFORM SUPERIORITY** in all these brands—a fact of immense importance to the motorist. In other words, United States Tires **HAVE THE STRENGTH OF FOUR**, yet they sell at precisely the same price asked for other kinds. They are undeniably

America's Predominant Tires

United States Tire Company,
Broadway at 58th Street, **New York**

Branches, Agencies or Dealers Everywhere

TIRE FACTS



Air is the only perfect cushion.

There is no elasticity in the tire itself.

The tire transmits the shock to the air cushion, which absorbs it.

The tire prevents the escape of the air cushion through leaks caused by punctures, blow-outs and wearing-out.

The tire provides the traction to convert energy into motion.

Therefore—

A satisfactory tire should combine materials giving resiliency, strength, imperviousness and a non-slipping surface.

The KING Combination Tire

is the only tire which possesses **all** these requisites. There is no other tire like the King as its special features are fully protected by patents against infringement.

It is **not** a tire protector, tire cover or tread but a **complete tire** and carries a **Steel Shod Guarantee** of double mileage and against punctures and blow-outs.

Don't compare our prices with others without comparing our goods—that is all we ask—we invite such comparison.

KING LEATHER TIRE CO.
3432 Vliet Street, Milwaukee, Wis.

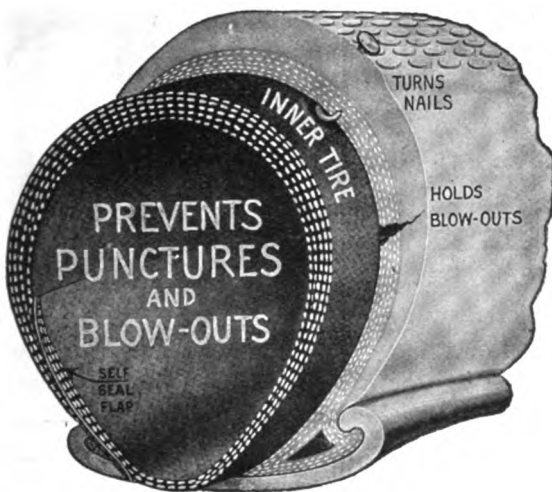
Please mention the Automobile Dealer and Repairer when writing to advertisers.

Mr. Dealer, Get the Agency For this Live Proposition!

There are more Inner Tires and re-inforcements sold this year than ever before. A big demand already exists for our Interlock Inner Tire, and YOU should be in position to supply this demand. The reason is plain, and easily understood. Every automobile owner WANTS to get the maximum service from his tires and eliminate punctures and blowouts. Below we give you a brief description of what the Interlock Inner Tire will accomplish and then let you judge for yourself whether you want to take on this line in your territory.

INTERLOCK INNER TIRES

"Insure the Most Miles at Least Expense."



1st. When placed in new or practically sound tires it gives double-strength, as it is made as heavy as the fabric body of the tire itself.

2nd. Being cement coated, it adheres to the inner walls of the casing, and prevents creeping or doubling up.

3rd. In old casings, it covers up the fabric breaks or cracks

in the tire, thus renewing the strength of the casing, and preventing tube pinches.

4th. It adds ALL the STRENGTH of the RE-INFORCEMENT to ALL the strength of the CASING. When the casing is no longer serviceable the "Interlock" can be removed and used in another tire. Therefore, the cheapest miles that can be obtained from a casing are those which the Interlock will add to it.

5th. It is NOT an inner shoe, or reliner, but an INNER TIRE, completely envelops the tube, gives a RE-INFORCEMENT to the sides of a casing, as well as the tread, a feature not found on any other inside re-inforcement.

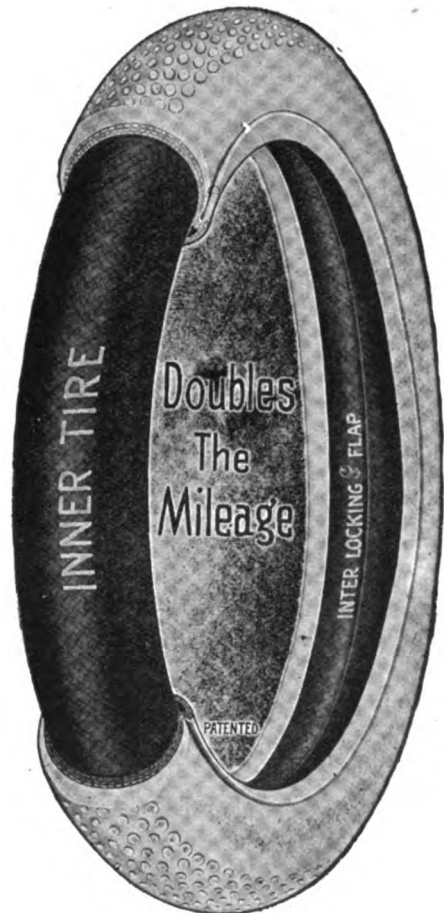
We want every automobile owner to receive free, one of our illustrated booklets, "Tire Troubles and Expense," which will be mailed promptly if you will write for it to-day. We will mail small sample to every owner giving us the name of dealer and tire repair man.

ADDRESS THE
DOUBLE-FABRIC TIRE CO.,

18 E. 7th STREET,

AUBURN,

INDIANA.



Mail
this Coupon
to us To-day.

Double-Fabric Tire Co.
18 E. 7th St., Auburn, Ind.

Please send me your Free Booklet, "Tire Troubles and Expense."

Also Prices for.....

.....Tires.

NAME.....

ADDRESS.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Will you spend
a minute a day to
double the life
of your tires?

Practically without effort, and with only a minute's time daily, you can get \$2 in tire service for every \$1 you pay for tires. Read about



MOORE TIRE SAVING JACKS

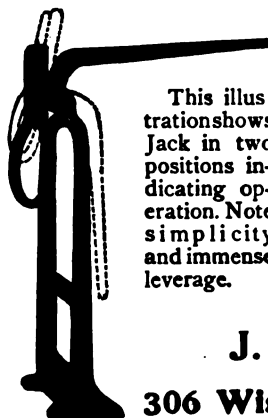
They take **all** weight off the tires.

Over half the life of your tires is spent at rest. Standing still as well as running they are working—supporting a load—wearing out. You can save this wear for the 8 to 14 hours a day your car is at rest, by jacking it up every night—only 30 seconds' work with a set of Moore Tire Saving Jacks.

The picture tells the whole story—just slip the loop over the hub and push down lever. The leverage is so great a man or boy can easily jack up the heaviest car. Leather pad on ring prevents marring hub. Once adjusted for your car they need never be changed.

A set of four Moore Tire Saving Jacks costs only \$6.50 at your supply dealer's, or will be sent direct from the factory to you upon receipt of price. Carrying charges prepaid East of Rocky Mountains. Money back if you are not satisfied. If you "care a hang" for tire expense—if you want to double the life of your tires—these jacks are worth many times their cost to you. There is nothing more to tell. Make up your mind now to order a set and clip the coupon as a reminder.

As a Reminder
tear off this
Coupon
NOW



This illustration shows Jack in two positions indicating operation. Note simplicity and immense leverage.

Dealers

To any responsible dealer in motor car supplies we would like to submit a proposition whereby we both may make more money. Ask us on your business letterhead.

J. C. MOORE & COMPANY

306 Wisconsin Street,

Racine, Wis.

J. C. MOORE & COMPANY, 306 Wisconsin Street, Racine, Wis.
For the enclosed \$6.50 please send me one set of four Moore Tire Saving Jacks (carrying charges prepaid East of Rocky Mountains) upon condition that you will refund my money in full if not satisfactory to me.

Name.....
Address.....
Make of Car.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.

All Roads Look Alike to Woodworth Treads

THE BEST TIRE PROTECTORS ARE THE CHEAPEST

Our experience, extending over seven years, and the manufacture of over 75,000 protectors, together with our first-class manufacturing facilities, not only enables us to manufacture better protectors than the more inexperienced firms but also enables us to make protectors at a price that will average considerably cheaper.

WOODWORTH TREADS, on account of being made with treated leather which is not affected by water, are much more durable than protectors made of plain chrome leather such as is used by other makers. On account of being held with coil springs, they are always a perfect fit on the tire so that they not only consume less power but they never become loose to chafe and injure the tires. The rivets which we use are of our own design and not only give longer wear but hold better in the leather than the rivets ordinarily used.

When you buy Woodworth Treads, you can feel sure you are buying the best that can be produced and you can know they are made by an old, reliable firm that has a reputation for good goods and fair dealings to maintain.

If you wish to feel safe against tire troubles, to have an anti-skid always in place and to reduce your running expenses, you should have a set of Woodworth Treads.

Sold by all first-class dealers, or shipped, express prepaid, from the factory.

Send for 1911 catalogs and booklet on the "Preservation of Tires."

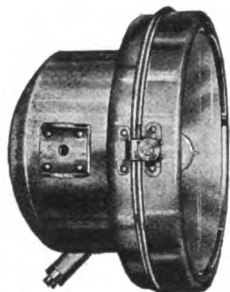
Leather Tire Goods Company

NIAGARA FALLS, N. Y.



Electric Road Lighting Outfit

"The Successor to The Gas Tank"



Current Direct from Magneto

The K-W ROAD LIGHTING OUTFIT—Magneto, pair of Head Lamps, Switch, Wire and Bulbs, all complete for..... **\$50.00**

THE SIMPLEST ELECTRIC LIGHT OUTFIT IN THE WORLD. PERFECTLY RELIABLE.

NO Storage Battery to Sulphate or Short Circuit.
NO Commutator or Brushes to make Trouble.
NO Complicated Cut-Out to go wrong.
NO Delicate Ammeter or Voltmeter to lie to you.
NO Complicated Electrical Connections and the PRICE is right.



Master Vibrator

for all cars using vibrating spark coils, and **ESPECIALLY FOR FORD CARS**

You will never know how much speed, power and flexibility there is to your Ford car, until you install a K-W Master Vibrator.

The K-W Master Vibrator takes the place of the separate vibrators on your coil, giving you one fast vibrator and powerful condenser for all of them, thus giving absolute synchronism, with a smoother running engine and

MORE POWER

No engine is better than its ignition. Improve your ignition and increase its power with a K-W Master Vibrator—thousands of satisfied users.

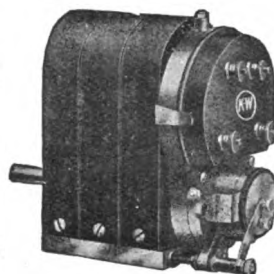


PRICE, \$15.00
EXPRESS PREPAID.



High Tension Magneto

Model J
Guaranteed to Start Auto Engines up to 30 H.P.



No Coil
No Timer
No Batteries
4 Cyl. \$50.00
6 Cyl. 55.00

Absolute Synchronism and perfect results at all speeds.

Extremely simple—nearly half less parts than any other Magneto. Perfectly reliable.

We make larger Magnetos for larger engines.

If you cannot gear drive a High Tension Magneto, use one of our \$35.00 Low Tension belt or friction drive Magnetos, and a K-W Spark Coil.



Low Tension.....\$35.00
Belt or Friction Drive.
Used with K-W Coils.
NO Moving Wires.
NO Brushes. No Commutator.
Runs in ball bearings.
Starts engine without batteries.



The K-W Spark Coil.
4-Cylinder.....\$30.00
2-Cylinder..... 18.00
1-Cylinder..... 12.00
Has its winding
GUARANTEED FOREVER
against breakdown.

WE PAY THE EXPRESS East of the Mississippi River or to the Mississippi on points beyond, on any of our goods, when cash accompanies the order.

No matter what your ignition troubles are, we have a guarantee cure. We also make Low Tension Magnetos and Spark Coils.

WRITE FOR CATALOGUE 16.



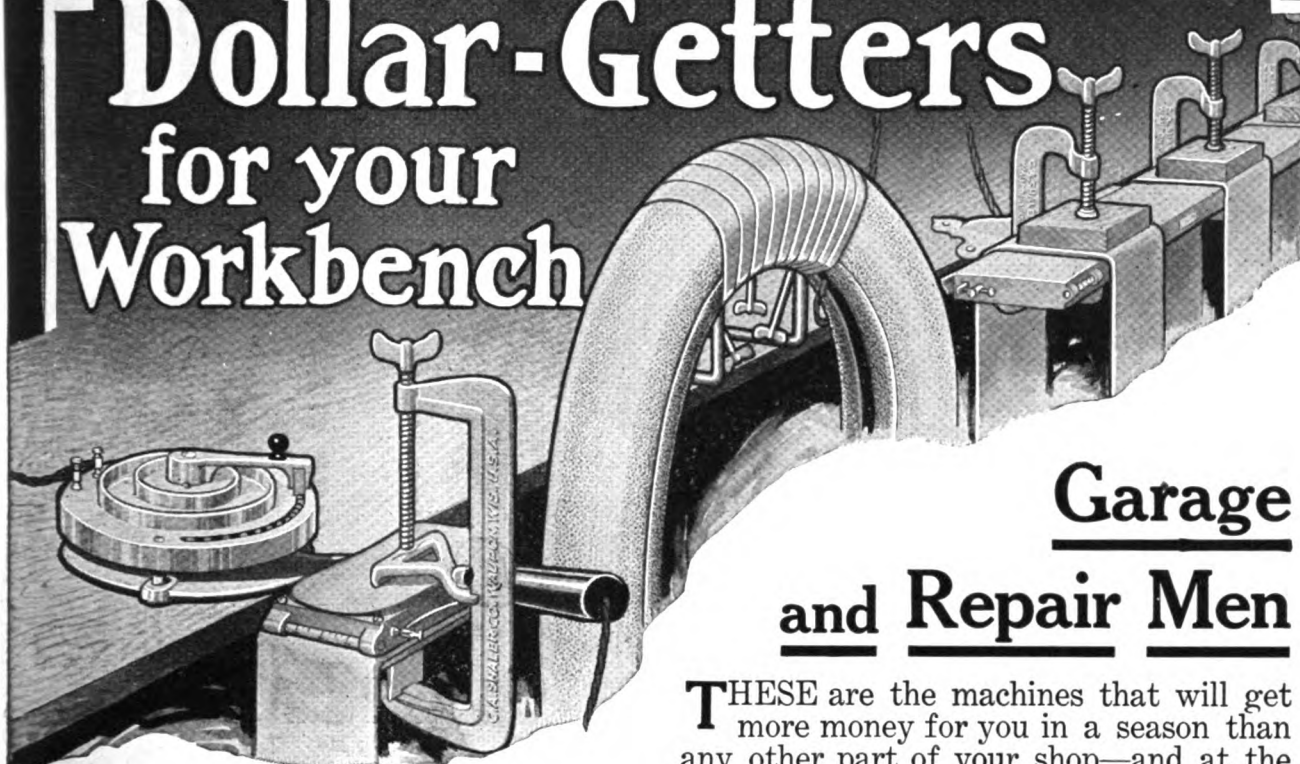
FOR SALE BY

New York: A. H. Green & Co., 1686 Broadway.
Boston: Mr. W. J. Forbes, 70 Long Wharf.
Philadelphia: The Vail-Schaefer Co., 608 Arch Street.
San Francisco: Weinstock-Nichols Co., 575 Golden Gate Avenue.
Los Angeles: Weinstock-Nichols Co., 1216 S. Olive Street.
Buffalo: J. W. Frey Auto Co., 700 Main Street.

Canada: Canadian General Electric Co., Toronto and Branches.

Syracuse: Syracuse Rubber Co.
Portland, Oregon: Rober Machinery Co., 281 East Morrison Street.
Kansas City: Kansas City Auto Supply Co.
Omaha: Powell Supply Co.
New Orleans: Interstate Electric Co., Baronne and Perdido Streets.
Cincinnati: L. E. Bedinger, 311 Main Street.

Dollar-Getters for your Workbench



Garage and Repair Men

THESE are the machines that will get more money for you in a season than any other part of your shop—and at the least outlay. There are always tires to be

repaired, and auto owners are willing to pay big prices for perfect work done without delay. Repair men reap a golden harvest with

SHALER *Electric or Alcohol Heated* **Vulcanizers**

Cost less than 2¢ per hour to operate—no boiler to explode—absolutely clean. You simply connect to the city current and when proper temperature is reached, the patented **auto-matic** heat control regulates the current so that the vulcanizer is held at the vulcanizing point indefinitely. In ten minutes you can learn how to make a perfect repair.

Type B

It will vulcanize either one or two tubes at a time or repair cuts in casings while still on wheel. The patented handle permits the moving of the vulcanizer from one job to another while still hot. There is a kidney shaped plate for casing repairs next to the rim and a double concave face for large tread repairs. The swiveled clamp enables you to apply the vulcanizer in five seconds and get an absolutely uniform pressure on all parts of the repair.

Prices for Direct or Alternating Current \$20.00 to \$25.00

Type C

This vulcanizer will mend any blow-out or tear that is practical to mend in any casing, by the simplest and cheapest method known. With it, the new fabric is applied from the inside instead of the outside, thus saving cutting away a lot of good rubber and requiring only about half as much new fabric and only a small percentage of the new rubber as is needed when a job is done with a steam vulcanizer.

For Alternating Current - \$20.00
For Direct Current - - - \$25.00

Type E

Will repair a twenty-four inch slit in a tube or make six ordinary tube repairs at one setting. Indispensable in garages having a quantity of tube work. Each repair is independently removable, so that it is not necessary to wait until the large, thick repairs are cured before removing small ones and replacing them with new jobs.

For Alternating Current \$25.00
For Direct Current \$30.00

C. A. SHALER COMPANY
805 4th Street
WAUPUN, WIS.

My lighting current is

Direct ☐

Alternating ☐

No Current ☒

Send The Coupon For FREE Hand Book

If you cut out the coupon now and send it to us with your letter head showing you are in the auto business, we will send you, free, the booklet "Common Sense About Tire Repairs," and confidential trade discount.

C. A. SHALER CO., 805 4th STREET WAUPUN, WIS., U. S. A.

Name.....
Address.....

A.
S.
B.

TIRE PROTECTOR

*An Offer
to Car Owners*

If we have no agent in your city or town
handling the A. S. B. TIRE PROTECTOR
as a separate line, we will send you one

ABSOLUTELY FREE

*This offer is good only for
30 days from date of this issue.*

This offer is made in order to prove to you that the A. S. B. Tire Protector is the only mechanically **Perfect Tread** on the market; that it will give you longer service than the tire itself, and absolute freedom from puncture and blow-out—or other tire trouble.

The A. S. B. Tire Protector is the only tread that **always** runs evenly on the face of the tire.

The A. S. B. Tire Protector is guaranteed not to heat the casing or tube as the openings on the side give the air a chance to circulate and cool the tire. In fact a tire equipped with an A. S. B. Protector runs cooler than without one.

With the car equipped on all four wheels with the A. S. B. Tire Protector you can figure on from four to eight thousand miles without tire expense or trouble.

If you want our offer of one tread free, write at once for particulars.

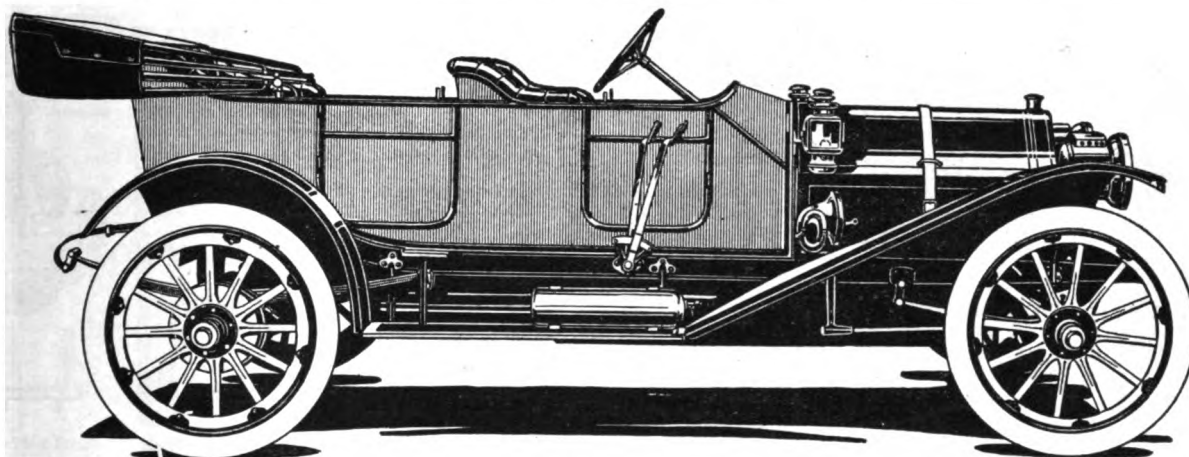
Queen Manufacturing Co.

41 Seneca Street, WEBSTER CITY, Iowa

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Cutting CARS

give the purchaser the maximum of style, power and satisfaction for the money invested. Engineering skill of the highest order, ample capital, modern factory facilities and a willingness to sell on a modest margin of profit, make Cutting Cars at Cutting prices possible.

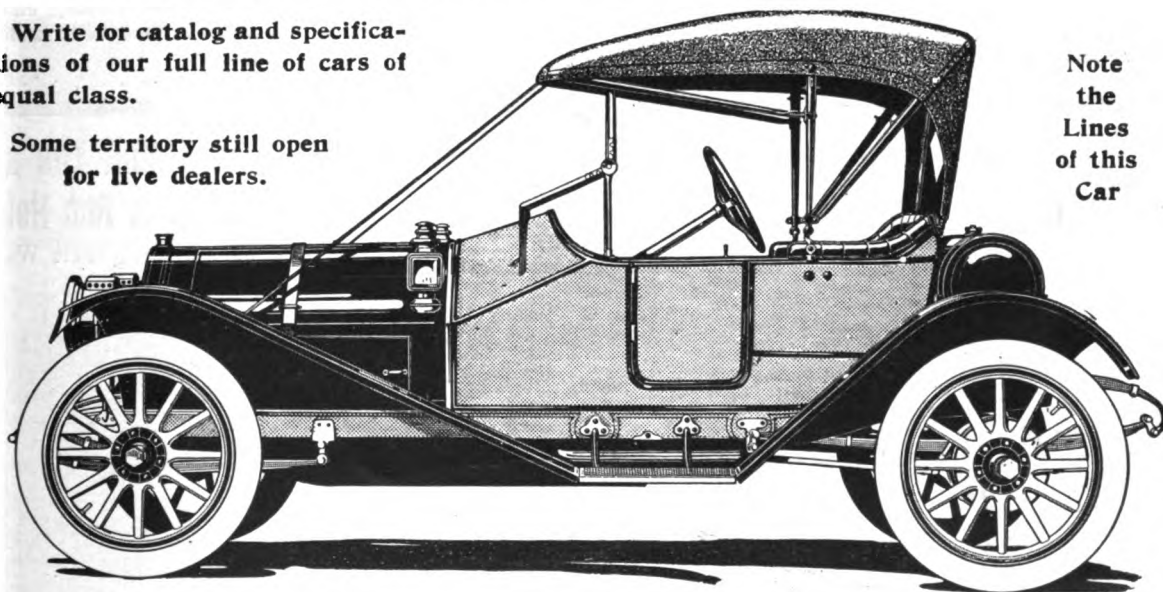


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The Torpedo Roadster shown below is distinctly in a class by itself—as to **quality, workmanship, general appearance and price.** It has 116 inch wheel base, 30 horsepower, 4-cylinder, long stroke motor and beautiful lines and finish.

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Some territory still open for live dealers.



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CUTTING TORPEDO ROADSTER, \$1200

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The 400 Steel Blower will serve the youngest mechanic faithfully without expense for a long lifetime.

Crank turns either way.



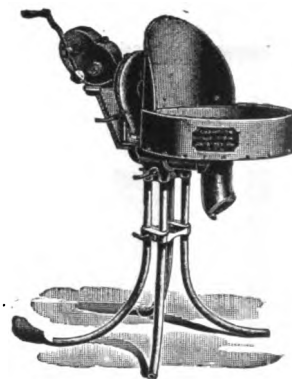
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Over one half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.

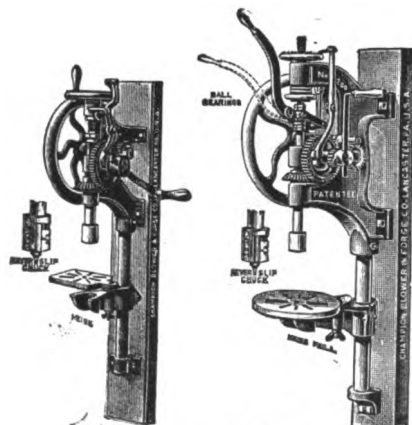
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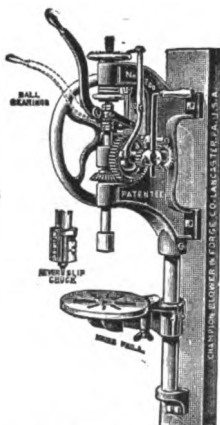
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No. 200 Drill.



No. 200 Lever-Feed Drill.

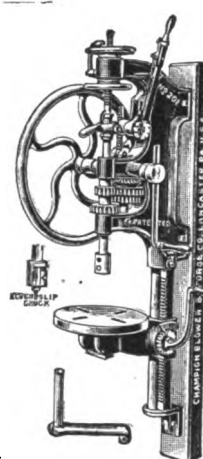
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Made With Ball Bearings only

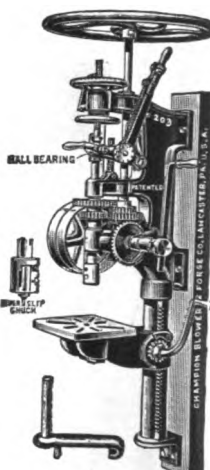
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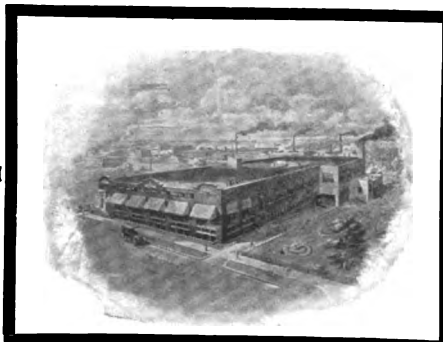
No. 202 Self-Feed and Double Compound Lever-Feed Drill.

THE CHAMPION BLOWER & FORGE CO., Lancaster, Pa., U. S. A.

GARAGE EQUIPMENT MFG. CO., 746 So. Pierce Street, Milwaukee, Wis.

Write for our Catalogue.

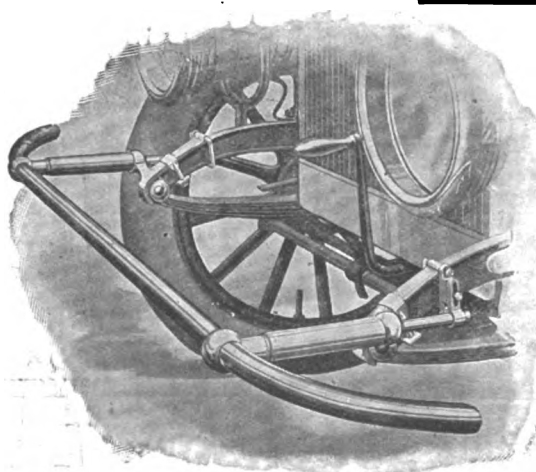
Our New Factory—The largest of its kind devoted exclusively to the manufacture of automobile accessories.



All our products are high grade in quality, workmanship and finish and you will find them salable and profitable.

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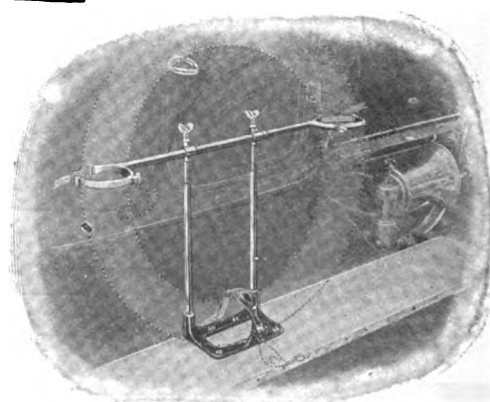


Will fit any car without drilling holes or removing bolts. Simply clamps to the frame. Strong, serviceable, ornamental.

Finished in black, nickel or brass.

FORE-DOOR Tire and Demountable Rim Holders.

Fills a Long Felt Want.



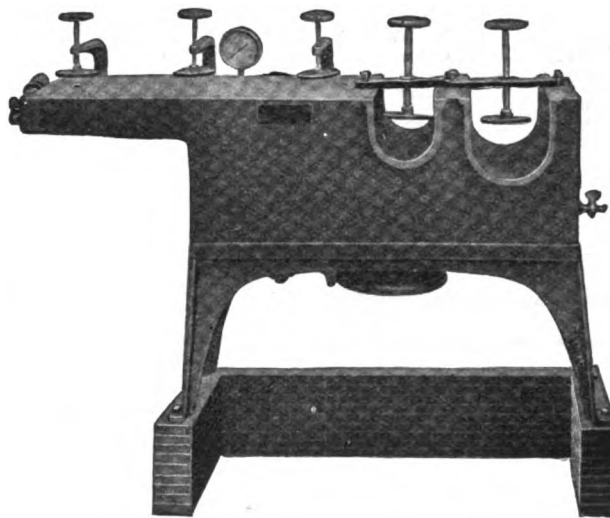
Contained entirely on the running board. Therefore it is unnecessary to drill holes or otherwise disfigure the body of the car. Can be adjusted to fit any sized tire. Finished in brass or nickel. Made in two sizes.

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Double Cavity Combination Steam Vulcanizer

Every Garage,
Every Auto
Repair Shop,
Every Car Factory,
Pays Out for
Tire Repairs in a
Month More than
this Machine
Costs.

Why Not Make a
Profit While the
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The Best Machine Ever Built
We Will Tell You More if You Write

Takes
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Repairs 15 Tubes
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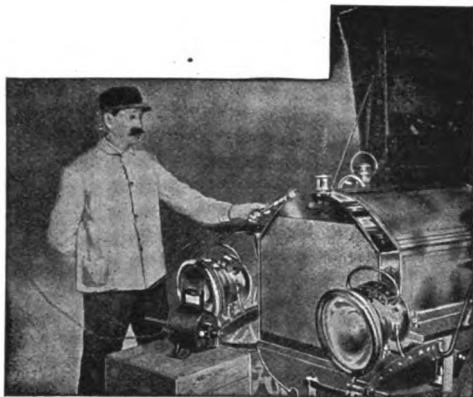
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Mirror Polished
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For Public or Private Garage.

Simply connect with a lamp socket and the plant is ready for work.

Can be used equally well for polishing silver plate, metal signs, bank and store fixtures. It will also do light portable emery grinding.

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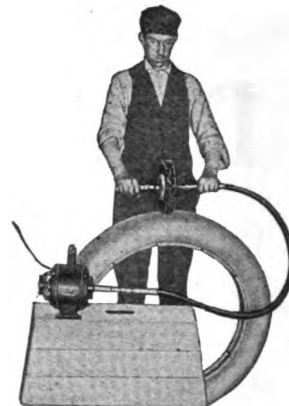
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STOW FLEXIBLE SHAFT

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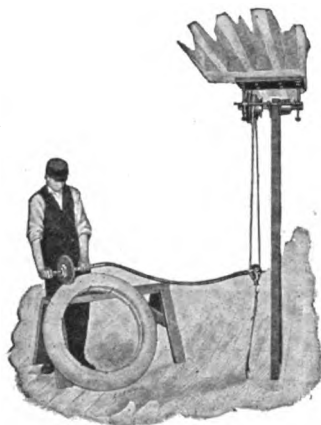
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We can furnish them either belt or motor driven as shown.

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Your old tires which you are about to discard can be made like new at a low cost. Don't throw them away—don't have them vulcanized—don't buy new ones

Our Exclusive Process Makes Your Old Tires Puncture and Skid Proof

Hundreds of motorists are getting thousands of extra miles out of old tires which they formerly threw away. Our

TRIPLE TREAD PROCESS MAKES OLD TIRES LIKE NEW



Before
Treating

We use this old casing as a foundation upon which to build, covering it entirely with tough, wear-resisting, waterproof, French Chrome leather, giving you a tire that is like new, and one that will often run from two to three thousand miles further than this same new tire would run. This has been demonstrated time and again.

Where the greatest wear comes there are three thicknesses of this leather. The outer ply is brought down the sides of the casing far enough to give ample protection to the sides of the case against rut wear; the second ply is brought down the sides of the case over the bead, being skived (tapered down) at the edge so that it does not in the least interfere with replacing the tire on the rim. This gives added strength to the sides of the case and protects it at the point of contact with the rim so that rim-cutting is practically impossible. The third ply takes the place of the old rubber that is removed from the case before the Triple Tread is applied.

In addition to the steel studs on the tread, there are from one to three rows of flat-headed steel rivets extending down the sides of the case as far as the outer ply comes, which gives an additional protection to this part of the case against rut wear. The steel studs in the tread and the side rivets fasten the different plies of leather securely together.

The Triple Tread is put in place and made to fit perfectly over every square inch of surface, so that when the process is completed the Triple Tread is actually a part of the old casing, the plies of leather, rubber and fabric being inseparately united.

An old tire Triple Treaded is actually better than a new rubber tire for the following reasons:

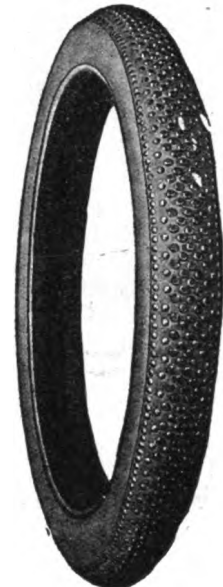
It makes your tires absolutely PUNCTURE-PROOF.

It makes your tires as nearly SKID-PROOF as anything can possibly be made—doing away with the use of chains at all times for the reason that our studded tread affords more traction than a chain.

It reduces the possibility of a blow-out to the minimum.

The Triple Treaded tire is as smooth and slightly in appearance as a new tire. It has none of the ragged edges or scalloped projections found on leather covers and detachable treads.

The Triple Tread, being actually made a part of the casing, cannot creep or become loosened and for this reason no more heat will develop than would be the case with an ordinary rubber tire.



After
Treating

Every Triple Tread is Guaranteed Perfect in Material and Workmanship

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makes automobile chains both riveted and detachable—
all sizes in stock.



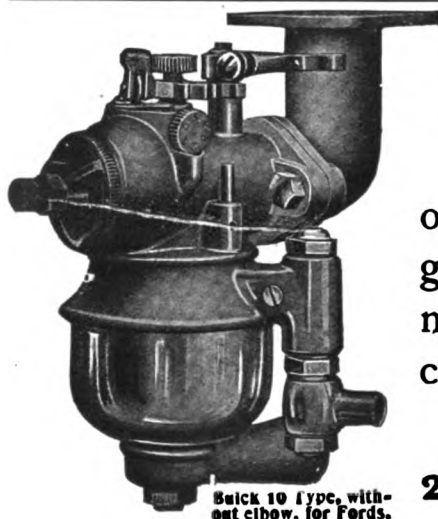
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Sprockets made to order.

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Made of Aluminum, nickel plated, heavy glass
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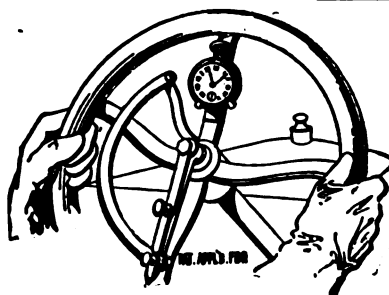
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Know the time all the time when driving

Get the **Time Clutch**



It keeps the time of day right where you can see it without tak-
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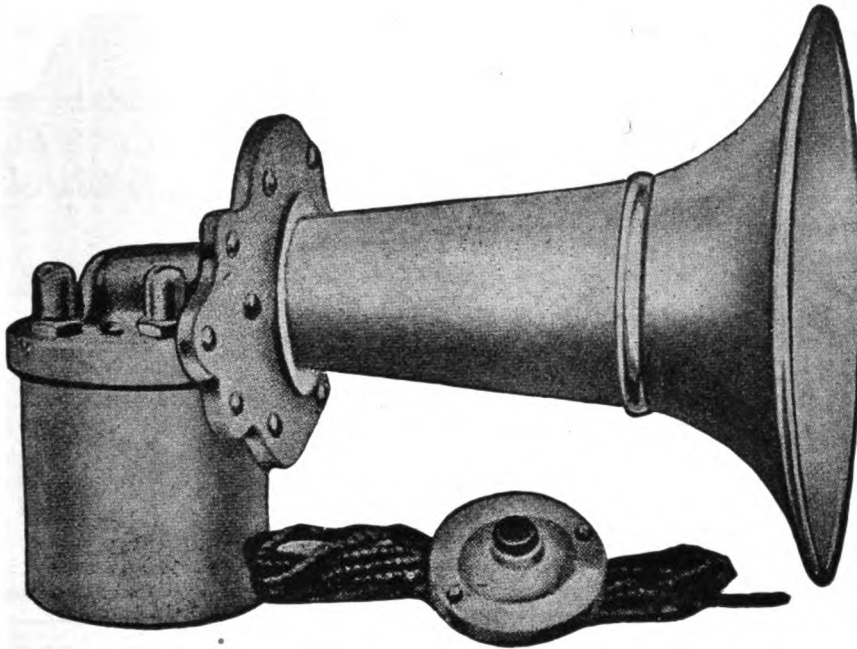
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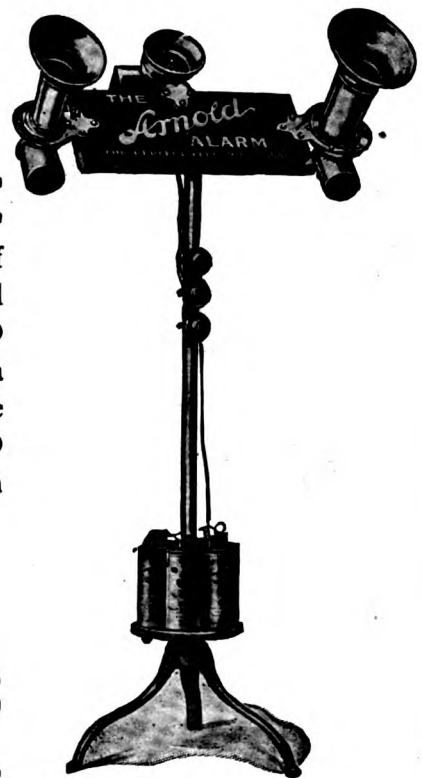
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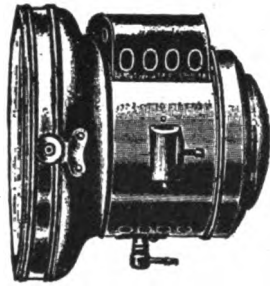
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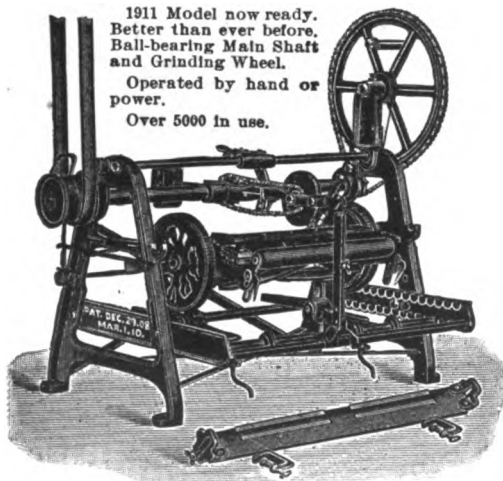
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"You Grind It as You Find It"

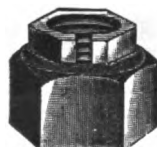


1911 Model now ready.
Better than ever before.
Ball-bearing Main Shaft
and Grinding Wheel.
Operated by hand or
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Over 5000 in use.

SEND TO-DAY for full description of this wonderful labor-saver and money-maker. Nothing like it on the market. Grinds all makes of Mowers perfectly in 15 minutes without removing reel-knife. New Skate Sharpener Attachment for Grinding Skates. Will more than pay its cost the first season, because it does the work so much quicker and better. Used by U. S. Government and City Parks. DO IT NOW. Address,

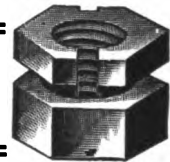
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COLUMBIA LOCK NUTS.

They Will Not Shake Loose.

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Diamond Tires—Greatest Mileage—Best!

Make of Tire	A Diamond	B MAKE	C MAKE	D MAKE	E MAKE	F MAKE	G MAKE	H MAKE	I MAKE	J MAKE
Sets Reported	41½	43	13	12½	8	7	6	7	4	3
Grand Total Mileage	256,639	239,975	70,300	65,798	34,100	21,594	20,236	20,200	14,000	8,450
Grand Total Time in Use	339½ mo.	404½ mo.	122½ mo.	82 mo.	93½ mo.	61½ mo.	37 mo.	46½ mo.	26 mo.	12½ mo.
Grand Average Mileage	6221	5580	5361	5371	4363	3084	3372	2825	3500	2816
Grand Total All Punctures	101	151	84	49	77	20	24	16	19	6
Grand Total Extra Casings used in time and mileage stated	23	34	6	6	9	6	9	3	5	1
Grand Total Extra Tubes used in time and mileage stated	54	73	24	10	9	17	7	9	5	4
Average Period of Use	8½ mo.	9¾ mo.	9½ mo.	6¾ mo.	11¾ mo.	8½ mo.	6½ mo.	6¾ mo.	6½ mo.	4½ mo.
Average Monthly Mileage	775¾	593½	573½	802¾	364¾	351¾	546¾	436½	538¾	676

NOTE THAT Within a shorter total time—indicating their use on largest and fastest cars—Diamond tires gave more mileage than any other tire, by from 11½ per cent. up to 120 per cent. above competing makes.

Observe, also, that users of Diamond tires bought fewer new tubes than users of other tires. This saving was in addition to the greater mileage they obtained.

We are able further to state that the total number of reports received by Mr. Weygandt, including those not tabulated for want of specific data, showed more Diamond Tires than any other in use.

Diamond Tires are just as good on the lighter, lower priced cars as on the heavier machines and give even greater mileage.

Don't think you can't use Diamond tires on your car because your original tires were something else. No matter what tires you have been using you can get Diamond tires to replace them, and this whatever style of wheel rim you have. You must be careful to specify the size and style. If you do not know the name of your style we can tell you.

Write for Booklet Containing the Complete Story of Mr. Weygandt's Inquiry and our book of Tire Instructions. Both are free.

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Distributing Points and Service Stations in 84 Cities, Covering Every Section.

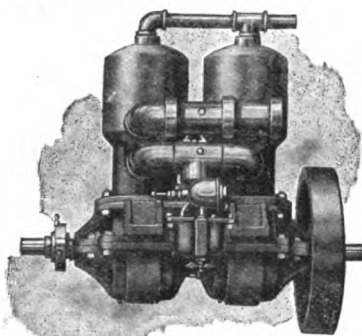
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No matter how good your power plant, we can improve it

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Reliable,
Economical.**



FREE TRIAL.

10-12 H. P. Water Cooled Motor,
Weight, 127 lbs.

More reliable than a four cycle engine. Surer to go and quieter.
And the price! We can astonish you and help you to meet all competitors.

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BLOWOUT PATCH

You know that the much talked of Hagstrom Porcelain Guard makes a difference. Next time you have Spark Plug trouble put in a set of "Hagstrom's."

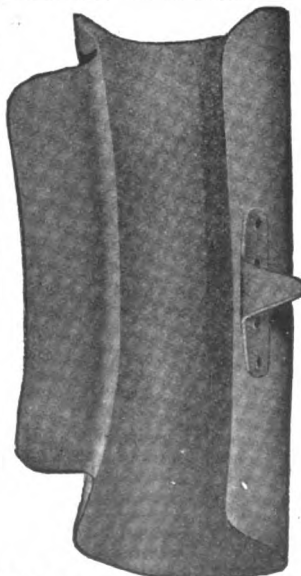


Now adopted by manufacturers of the highest grade of American cars as their 1911 emergency tire equipment.

For further particulars write at once to

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Through Illinois sand, Kansas mud, Ohio dirt-ruts, or Canadian Corduroy—the Overland tire *gets over*. A tire possessing real reserve strength, that is built for wear and tear, with the heaviest tread of any tire on the American market—reinforced where needed to overcome side friction when running in dried mud-ruts. The Overland is full size and made for either Dunlop or Clincher rims.

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**READRITE
POCKET
METERS**

Noted for
**Accuracy, Durability
and Permanency.**

Written guarantee for one year with each meter.

Ammeters, \$2.50
Volt-meters, \$3.50
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Write for Circular and Discount to Trade.

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The "High-Quality-Sane-Price" Car

The "high-quality sane-price" car briefly describes the Inter-State. We claim as do the operators of these cars, that in the Inter-State the greatest automobile value in America is given. The Inter-State with its medium price possesses characteristics and refinements of cars costing twice as much.

The splendid features of construction of the "40" models given below are merely a few of the Inter-State's most striking components. Our beautiful catalog gives the many other distinctive features. The catalog sent free upon request.

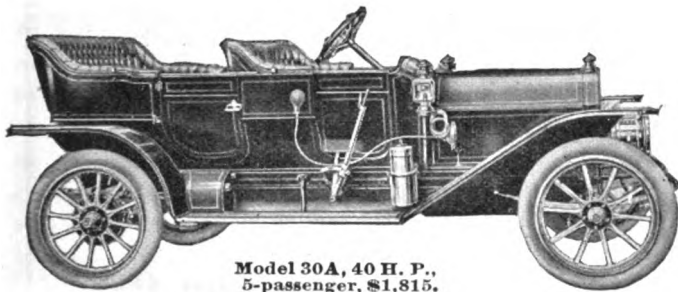
40 HORSE-POWER MODELS

A Few of Many Superior Points of Construction. Bore of Motor $4\frac{1}{2}$ in. Stroke 5 in.

1—This $\frac{1}{2}$ in. greater stroke gives more horse power for lighter weight motor. 2—Motor of longer life. 3—Greater economy of gasoline; 20 miles to the gallon under favorable road conditions. 4—Fine radiating surface. 5—Smoother running, less noise. 6—Reduced speed of action means reduced wear on bearings, valves, valve-stems, cams and crank shaft. 7—Longer stroke results in reduced temperature at exhaust valves; thus, valve-grinding is exceptional. 8—Increased compression and resultant economy of operation. 9—Better mixture and vaporizing of charge gives greater flexibility; the motor can be throttled down to lower speed and a steadier, more quiet and smooth pull on hills.

INTEGRAL CLUTCH AND GEARSET RUNS IN OIL

(Found only in a few of highest priced cars.)



Model 30A, 40 H. P.,
5-passenger, \$1,815.
Special Equipment.

Greater rigidity and absence of friction—no loss of power, as clutch and gearset are of integral or unit design.

Power Transmission by Enclosed Propeller Shaft. Eliminates torsion bars and distance rods; no destructive sand or dust can work in crevices.

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CANADIAN BRANCH: Hamilton Machinery Co., Hamilton, Ont., Canada.



YOUR FEET ARE A TURNTABLE

When you want to go in the opposite direction you don't walk backwards. You turn round, your feet acting as a kind of turntable.

When you want to get your car out of the garage, it's neither safe to the car or passerby, nor convenient to yourself, to back out—it's far safer and more convenient to turn the car round on a turntable and drive out the right way. A

LANSING TURNTABLE

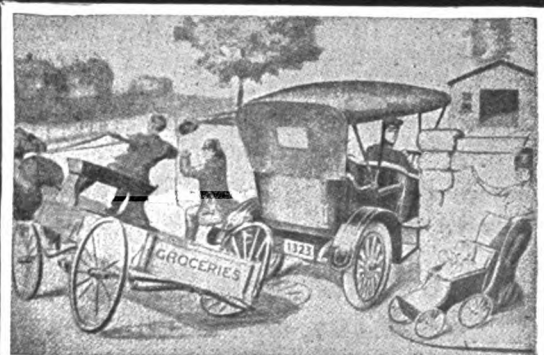
is easily installed, either inside your garage or just in front of it; makes an admirable wash stand for your car; is very easy to operate; will last a lifetime; will save its cost by saving the cost of accidents and of injury to your car, and can be furnished in any size you want.

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Out—
Not
Back
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For Transmission and Gear Lubrication

— MANUFACTURED BY —

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BRANCHES: — New York, Philadelphia, Boston, Chicago, Pittsburg, Cincinnati, Indianapolis, Terre Haute, Savannah, Charlotte, Knoxville.

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All You Need to Repair the Worst Puncture



And do it instantly—for M. & M. Cement is instantaneous—positive—and self-vulcanizing. No waiting—steam and electric vulcanizing is old-fashioned and too slow for repairing punctures.

M. & M. is easy to use—on the road or in the garage.

Let us prove to you that M. & M. has qualities peculiar to itself—one of which is that of satisfying users.

M. & M. costs no more than uncertain brands, and will repair punctures quicker and better than the so-called "Just as Good" variety, and you take no chances of injuring the tubes.

We certainly feel proud of the fact that we have imitators—for the best is always imitated.

The Superiority of M. & M. has made it the Standard Brand to the motorist.

It has—and always will give those satisfying results.

Insist upon M. & M. the next time you are in need.

Sold by all jobbers and most dealers, or if your dealer does not handle it, sent direct, express prepaid.

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THE M. & M. MFG. CO., Akron, Ohio.

P. S.—We are manufacturers of the famous *Knead-It*, for filling up those dig-outs in your casings—*It stays put*. 50 cents a can.

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For Automobile Running Boards, Floor Boards, Motor Boat Floors, and for any place where matting is exposed to severe wear.

Aluminum Matting is very easily applied.

It will not rust, tarnish nor stain from the effects of oil, grease or gasoline.

It can always be restored to its original brightness when washing the car.

Yet it costs less than good rubber and will last much longer.

Stock sizes are 9, 10, 12, 14, 15, 18 and 20-inch widths, in rolls of about 50 lineal feet, and 24 and 30-inch widths in 24-foot rolls.

Also in sheets 36 inches wide by 84 inches long.

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SPLITDORF COMMON SENSE PLUGS



have every quality that a superior plug should possess.

That's why they have always maintained their great popularity.

We have positive record of these Plugs which have been in constant use for seven years, and will give proof of same to anyone interested.

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SHOCK ABSORBERS INSTALLED FREE

Can you ask for anything more? It has cost us thousands of dollars to inaugurate this great CONNECTICUT INSTALLING SERVICE. We are making it possible for EVERY motorist to buy CONNECTICUT Absorbers and have them installed without cost. The remarkable demand for CONNECTICUT ABSORBERS has made this necessary.

This absorber is sweeping the field, because it is perfectly designed, made of the very best of material, and all motorists will appreciate the fact that it is installed on their cars without trouble, cost or bother.

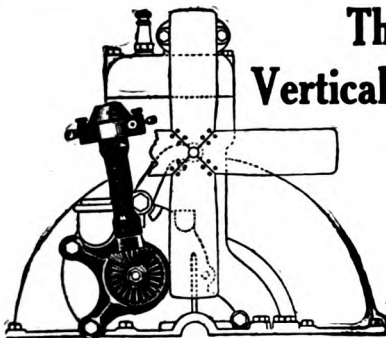
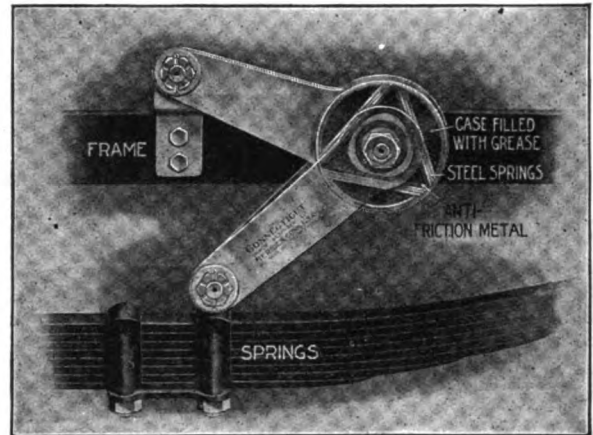
Send us the model, year, make and weight of your car and we will tell you just where to go to have YOUR CONNECTICUT Absorbers installed free of charge.

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A model especially adapted for use on the Model T Ford Motor.

Apply one to your automobile motor and bring your timer up into a conveniently accessible position for cleaning and adjustments.

Write for free descriptive circular and prices.

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Machinists and Manufacturers of Automobile Specialties

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We manufacture Jacks of all descriptions having capacities of from 1000 to 2000 pounds.

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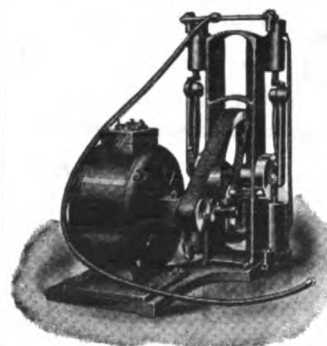
Send for our New Catalogue of Garage Machine Tools and our List of over 80 Piston Patterns.

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For Direct Tire Inflation or Storage Tank.

NEW AND VALUABLE FEATURES not found in other compressors.

Used in the best Public and Private Garages, also in Auto and Tire Salesrooms.

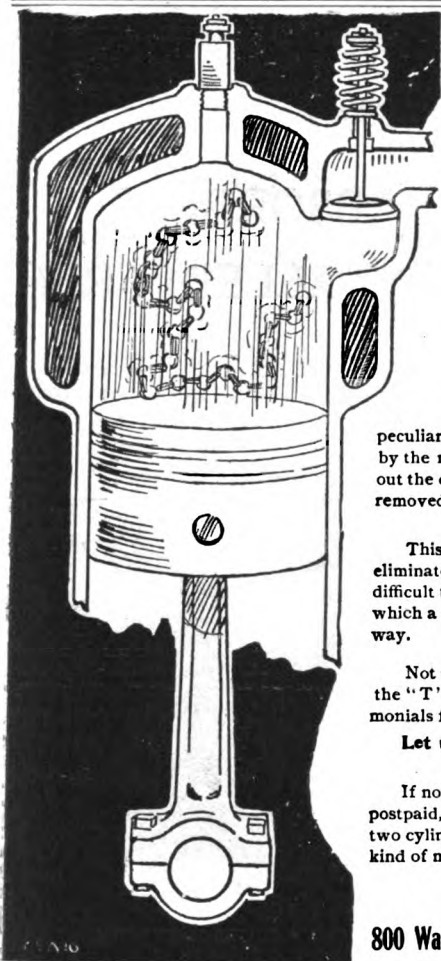
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MICHENER'S CHAIN CARBON REMOVER.

This carbon remover is a small flexible coil chain, made of tough soft wire manufactured especially for this device; is as flexible as a piece of twine and absolutely harmless to the motor.

* * *

It is inserted into the cylinder through the spark plug hole, a little kerosene is injected at the same time, then the spark plug is replaced and disconnected from the ignition circuit, the motor is then run about two minutes at a medium rate of speed from power developed by the remaining cylinders. The peculiar construction of this carbon remover when thrown about by the moving piston, loosens the hard dry scale and it is blown out the exhaust. When the cylinder is clean the chain is easily removed by a special hook for the purpose.

* * *

This device saves the expense of tearing down the motor, eliminates disturbing the bearings and adjustments which are difficult to secure again. Does not scratch or nick the cylinders which a sharp edge tool is liable to do in the old "hand-scraping" way.

* * *

Not recommended for horizontal motors, Cadillac or some of the "T" type motors like Maxwell. We have hundreds of testimonials from owners of nearly all kinds of motors.

Let us send you our booklet of testimonials.

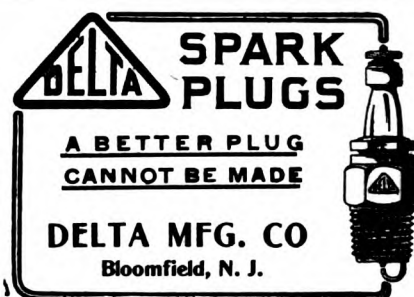
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If not sold by your dealer, let us send you one by return mail, postpaid, for **75 CENTS OR THREE FOR \$2.** (You can clean two cylinders at the same time with two chains.) Always state kind of motor as chains are made different sizes.

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TIRE CHAINS WITH BONE HARDENED CROSS CHAINS

Whittaker Chain Tread Co.
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Porcelain or Mica.
All Threads.
PRICE, \$1.00 Each.

Maximum Power—Positive Ignition
Minimum fuel consumption.
Equip your car now and save money.

MAC-KAE MFG. CO.,
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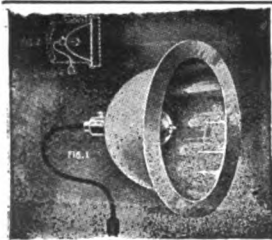


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BRAKE BAND LINING

WEARS INDEFINITELY
SOLD BY ALL FIRST CLASS DEALERS

Manufactured by THERMOID RUBBER CO., Trenton, N. J.



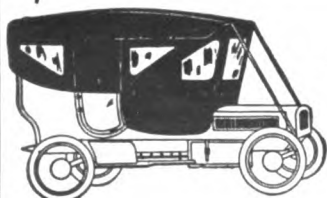
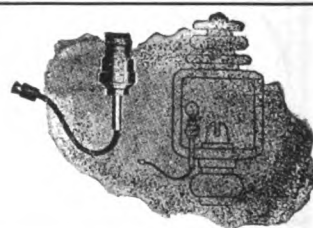
They are DANGEROUS and DIRTY

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Ask for Booklet No. 3—it tells you all about it.

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AUTO TOPS, \$25.00

Auto Bodies in the White, Painted or Trimmed. Write for Auto Catalogue and quotations.

BUOB & SCHEU,

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Escape by using YANKEE TIRES AND TUBES

The quality will satisfy you. Prices will surprise you.

No better tires or inner tubes at any price.

We can save you big money.

Write Now for 1911 Price List.

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Fouled Spark Plugs? Sticky Cylinders? Pre-Ignition? Loss of Power?

Sure signs you're using a "non-carbonizing" oil that *carbonizes*.

Now-a-days every oil is claimed to be "non-carbonizing." Your own experience has shown you that *most* of them are *not*. And most of those that *are* have so *low a fire test* that they *burn too quickly*. That's why so many engines are worn out through *lack of lubrication*.

SPEED-OIL is different from all other oils because of its **higher fire test** and because it **cannot carbonize**. **SPEED-OIL** maintains constant compression, increases speed, makes the hills easy, and keeps the engine **clean and perfect running year in and year out**.

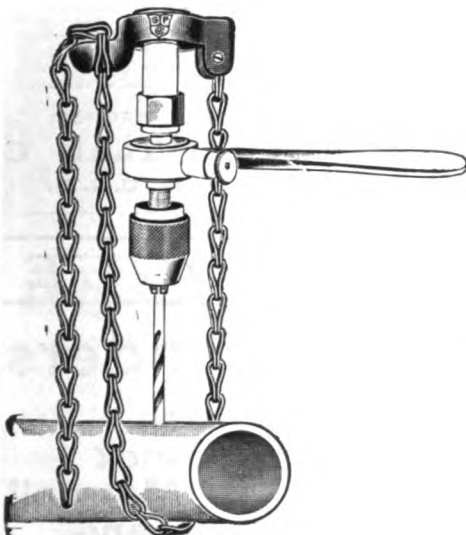


If your dealer hasn't SPEED-OIL, INSIST and he will get it. Or, let us ship to you, freight prepaid, a barrel or half barrel without charge for 30 days' trial. It won't cost you a cent if it doesn't suit.

Write for our Speed-Oil Booklet.

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This makes a very handy combination which is light and allows of packing in very small space. As will be seen from the illustration the Chain Attachment takes the place of a clamp or "old man."

Capacity 0 to $\frac{3}{8}$ inch Holes

The Drill and Chain Attachment may be purchased separately if desired, and the latter used with almost any style of Ratchet Drill.

Fully described in Catalog No. D 10.

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	CASINGS		TUBES			Reliners	By Mail add
	1st Quality	2nd Quality	1st Quality	2nd Quality	By Mail add		
28x3	\$10.30	\$8.75	\$2.75	\$2.40	\$0.33	\$3.30	\$0.33
30x3	11.30	9.75	2.85	2.65	.34	3.42	.34
30x3½	15.45	11.70	3.75	3.25	.47	4.08	.37
32x3½	16.70	13.00	4.25	3.50	.48	4.20	.39
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MOTOR CYCLE CASES		TUBES	
Seconds--All New Stock	Barley	Tubes	Tubes by Mail
28x2	\$5.00	\$2.25	\$2.40
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Send for price list on all size Cases, Tubes and Reliners. On receipt of 10% I ship, allow examination. Many have re-ordered. If you order a Tube or Reliner and want it sent to you by mail, send Post Office Order for total amount.

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Largest Mail Order Tire Dealer in the Central States.



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In all earnestness and sincerity we hereby present to the ambitious and far-seeing man a most remarkable and unusual opportunity.

Perhaps you are not getting either the fame or the fortune out of life that your ambitions, training and experience warrant.

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Break away and join our new, non-competitive and fascinating field of OXYPATHY.

Give all or part of your time to OXYPATHY and your reward may be anywhere from \$50.00 per week to \$81,500.00 in 23 months, which is what some of our staff are today earning.

It will only take you a moment to write for further details.

Are you interested enough in your own future to make the first move?

THE OXYGENATOR CO.,

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Already Represented in Almost Every Section of America.

Gasoline Pump for Private Garage.

This cut of the Eastern Pump is our specialty for Private Garages where they want the very best that is made at a reasonable price.



The Pump in the above cut pumps a given quantity to a stroke of the lever, and is fitted with shut-off valve and anti-drip nozzle; also fitted with hose connections. It is made of the best material and workmanship that can be put into a Pump.

Get full information by writing to

Eastern Oil Tank Co.

Lowell, Mass., U. S. A.

WRITE—FOR—CATALOGUE

Rumble—Seats—Bodies—Tanks—Fenders



This is just one of the various styles we make

SPECIAL SEATS FOR THE

Brush Buick Maxwell Reo—and Other Cars

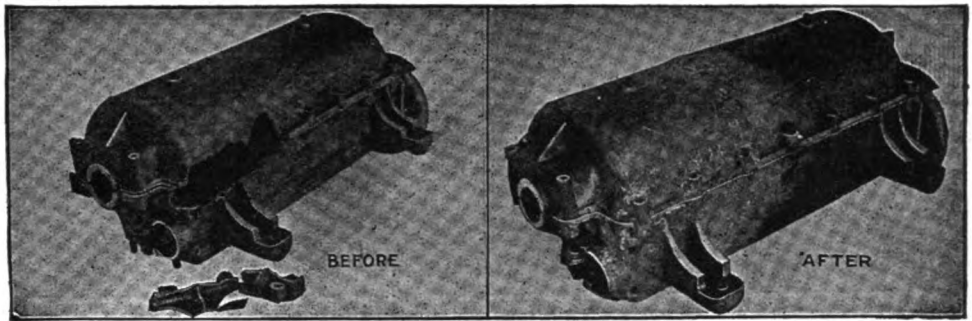
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We Weld all
Metals,
Cast Iron, Steel,
Aluminum, Bronze,
Malleable Iron.



OUR WORK IS GUARANTEED.

You take no risk in sending your work to us, no charge if not successful.

Frozen Cylinders and Broken Aluminum Cases a Specialty

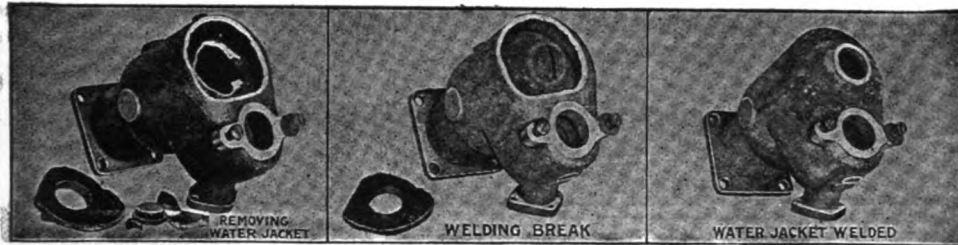
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THREE PLANTS

Davis Bournonville
Oxy-Acetylene Welding
Plants Supplied

"THE WELDING"
COMPANY
TRADE MARK



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The Best Way to be Sure of
Securing a Bright, Clean, Weather-
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FELTON-SIBLEY'S Auto-Top Dressing

Just put on a coat of it, as soon as the top begins to
show signs of wear—easily applied with a brush; it is dura-
ble and weatherproof. It dries quickly and is non-
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Comes in many standard colors—special shades to
order. Fine for carriage tops, too.

For tops that have never been painted, use "F-S"
Auto-Top Sizing. There's none better.

Write today for color card and prices.

FELTON, SIBLEY & CO., Inc.

Manufacturers of Coors, Paints and Varnishes

136-140 N. 4th St.

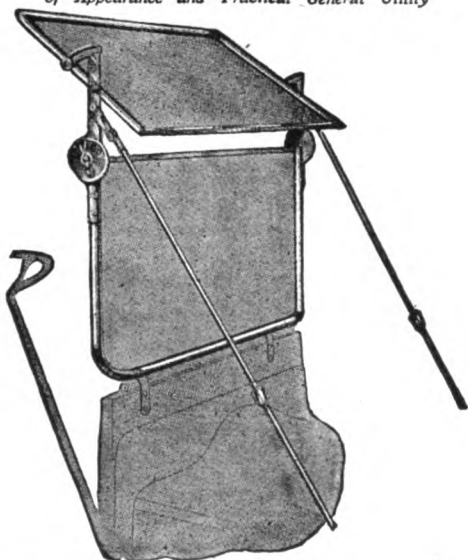
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VASCO

Wind Shields

Make Satisfied Customers

Because of its Convenience, Durability, Elegance
of Appearance and Practical General Utility



Position for rain, snow and sleet. You see the road between the sashes.

DEALERS AND AGENTS

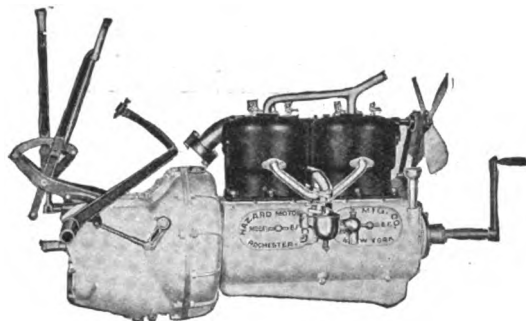
The demand for "VASCO" Shields has been established and is increas-
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participate with our other dealers in the business resulting from our
campaign. Do not delay but write to-day.

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Replace that Worn-Out Motor in Your Car With a HAZARD UNIT POWER PLANT



The THREE Point Suspension Makes it Easy to
Install in Practically Any Chassis at Small Cost.

Center Control

**OIL TIGHT
POWERFUL**

**DIRT PROOF
RELIABLE**

Write for Prices.

4 Cylinders, Two Sizes, 24 and 30 H. P.

HAZARD MOTOR MFG. CO., Scherer Street, Rochester, N. Y.

Guaranteed For One Year

Spark Troubles Ended

You can have Spark Plugs that do business every minute—that you can put in your motor and forget—that never short—never soot over—never break porcelains—or cause trouble of any sort—by insisting on

Never-Miss Spark Plug

Any Size or Type \$1.00

—the latest and best in Spark Plug construction. You'll get lots more satisfaction from your motor when you use them—over a million and a quarter thoroughly satisfied Never-Miss users. Magneto, Regular, Extension Types—open end. Mica, Porcelain, Lava.

Guaranteed for One Year

One of the strongest guarantees ever made, makes Never-Miss Spark Plugs worth trying.

Any jobber or dealer will replace any defective Never-Miss Plug within one year of purchase, no matter where bought.

This means absolute satisfaction.

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To Dealers Everywhere

Not to handle Never-Miss Spark Plugs is to miss a genuine live-wire connection—a real business producer. Write today for our dealer's proposition.

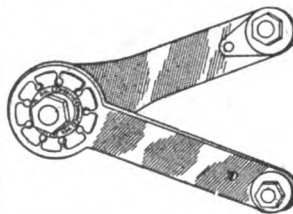
Never-Miss Spark Plug Co.,
Lansing, Mich.



\$1
At
All Live Dealers

It Doesn't Add to Your Pleasure or
Dignity to Be Bounced About In Your
Car Like a Pea In a Box. Equip Your
Car With

WESTEN SHOCK ABSORBERS



and not only add to your
COMFORT, but REDUCE THE UPKEEP of
engine, springs and tires.

WESTEN SHOCK ABSORBERS are superior to all other shock absorbers in that they have a two-degree frictional resistance which automatically takes up light or heavy jolts according to the condition of the roads.

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Have your Garage Man put WESTEN SHOCK ABSORBERS on your car today and reduce the cost of its upkeep.

Made for three weights of cars. Booklet of detailed information sent free.

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"BECCO'S SPECIALTIES" SAVE TROUBLE

Spark-Gap Terminals • Battery Connectors • Spark Plugs
Battery Boxes • Tire Grips • Wrench Sets

THE BECK COMPANY, Rockville Centre, N. Y.

Price, \$385



C. W. KELSEY MFG. CO.

MOTORETTE

As well built as a
\$6,000 automobile.

Send for Catalog B.

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ATTENTION E-M-F OWNERS.

WE HAVE adjustment fixtures for
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justments and does away with noise and
rattle.

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HORSEY

THAT'S THE NAME

ONE
MINUTE
REPAIR



USE
GASOLINE
ONLY

No Cement No Acid Inner Tube Patch

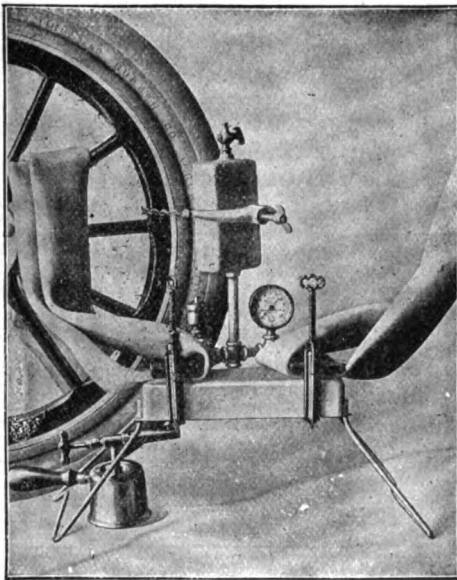
One trial of Horsey No Cement Patches and you will consign Cement and Acid Repair methods to the scrap-heap and be dollars ahead by doing it. **Automobile Kit**, box contains 10 assorted patches, **\$1.00**.

Motorcycle (Vest Pocket) Kit, box containing 6 small patches, **50 cents**.

Manufactured exclusively by

The Horsey Manufacturing Co.
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The Pittsburg Portable Steam Vulcanizer



For the Owner or the Garage

Weights less than ten pounds. Can be carried in the tool box and used on the road, in the house, or in the garage. Steam generated in five minutes with gasoline or alcohol, or with natural, artificial or acetylene gas. No experience required to make repairs to both inside and outside of casings, or punctures and blow-outs in inner tubes.

Ten-day Trial Proposition

Sold with a Money-back Guarantee

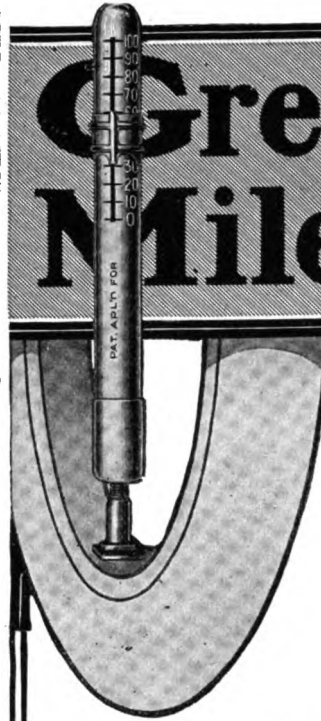
By means of our Inside Tire Vulcanizer, a blowout or section ten inches long can be repaired with one-half the material used by the average repairman, and the repaired part will be stronger than any other part of the tire.

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Greater Mileage

A
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You can get greater mileage, better tire service and more resiliency if you keep your tires properly inflated.

Every tire manufacturer will tell you this. Tires are made to hold a certain quantity of air—no more, no less.

You can't guess the pressure, that's impossible. But you can KNOW to a certainty with the

ALLEN TYROMETER TIRE PRESSURE GAUGE

This device saves its cost in no time. It fits the vest pocket—about the size of a fountain pen. Handsomely nickel plated, absolutely accurate. Just press TYROMETER on valve. Indication is immediately shown and held until you release it by a sliding band.

Get an ALLEN TYROMETER to-day. You will need it. Price, \$1.25 at all dealers.

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These Prices are Net Cash, Less 5 Per Cent.
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28 x 3½	4.45
30 x 3½	4.70
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34 x 3½	5.25
36 x 3½	5.60
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Use **Broadway Reliners** for Old or Weak Auto Casings.

Broadway Reliners are the **Heavy Type** and will stand endurance.

They cost a little more but are correspondingly superior. Sizes up to 4 inch are 3 ply, and over 4 inch are 4 ply.

Express charges **Prepaid** on orders for two or more.

Broadway Blow-Out Patches excel.

3-inch...40c. 3½-inch...60c. 4-inch...75c.
4½-inch...90c. 5-inch...\$1.10

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ERIE, PA.



READY FOR USE. ROLLED UP.

RUBBER PUTTY

*The Greatest Invention of its Class.
A True Money Saver and a Protection to Life and Limb.*



RUBBER PUTTY

Prevents blowouts, avoids sand blisters, saves fabric from decay, keeps out water, causes tires to wear out evenly and smoothly.

Requires no cement, will vulcanize itself, is applied in 5 minutes, does not soil the hands. Saves over \$50 in the season, gives safety in speeding.

Price \$1.25, Postpaid.

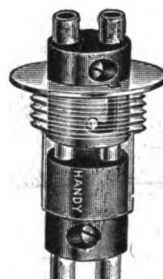
One regular can free of all cost.

Our Booklet will interest you.

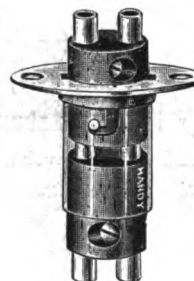
THE TOLEDO AUTO DEVICES CO.
709 GARDNER BUILDING, TOLEDO, OHIO

"HANDY" (TRADE MARK)

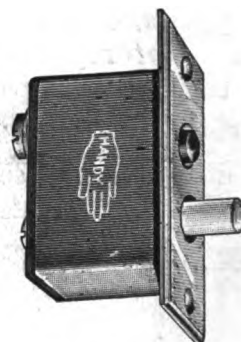
SWITCHES AND CONNECTORS



No. 4500—Dash Receptacle and Plug



No. 10000—Ediswan Receptacle and Plug



"HANDY" Flash Push Switch

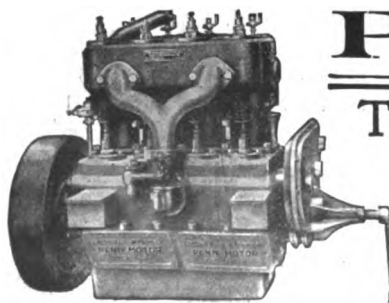
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Chicago Electric Mfg. Co.

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CHICAGO, ILL.



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THIS construction enables us to build the lightest, most compact and durable motor on the market.

Large Valve Areas and short lifts add to the power as well as the quiet running.

Crank-shafts of the suspended type.

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been placed on the market for and in connection with Automobiles, I
know of none which has been so universally needed as "AUTOLAC."
In fact this finish is such a step in advance of any other which has
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Wishing you deserved success, I am,

Very truly yours,

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Gallons, \$5.00; Halves, \$2.75; Quarts, \$1.50.
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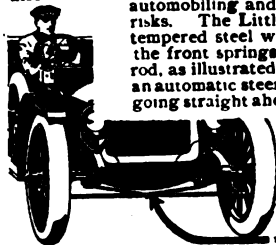
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Takes away all nervous strain and most all of the physical labor of steering.

It automatically keeps the car straight on rough, muddy or sandy roads, also when steering gear breaks or tire bursts. Increases the pleasure of automobiling and does away with or minimizes many of its risks. The Little Steersman is a coiled spring made of oil-tempered steel wire. The ends are fastened to the clips on the front springs of your car and the middle to the steering rod, as illustrated. It is then an auxiliary to the steering gear—an automatic steersman. The tension is such as to keep the car going straight ahead and always under perfect control. Still no extra exertion is required to turn corners.



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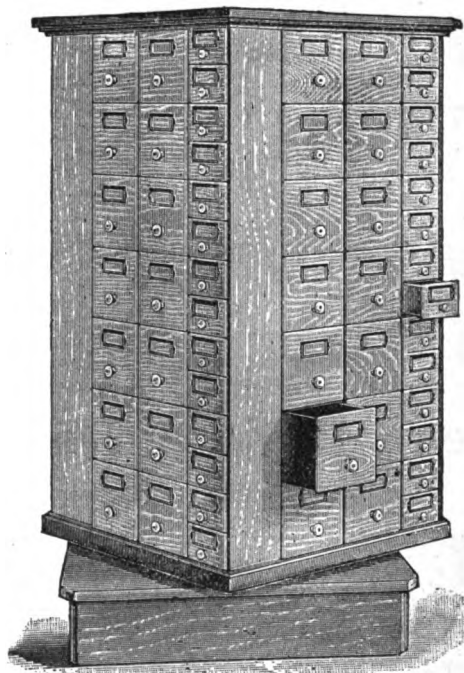
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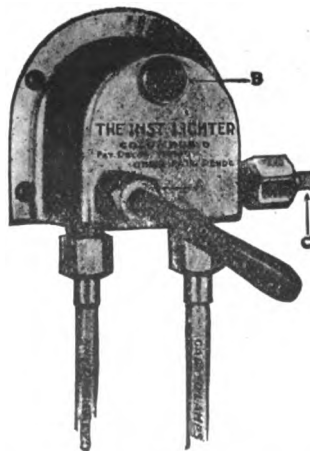
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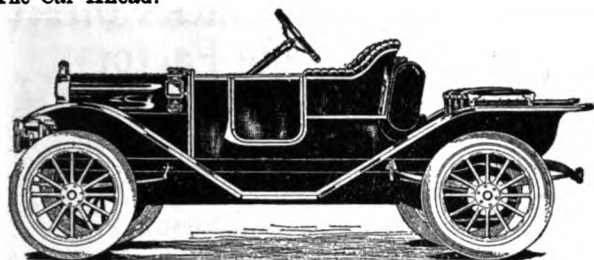
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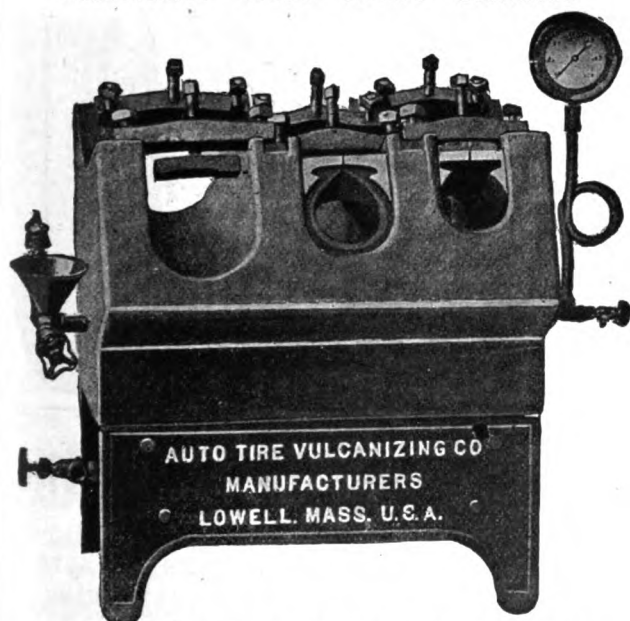
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Be sure to get J-M Non-Burn and your car will always obey the slightest pressure on the brakes. The name is plainly stamped on every few feet of this lining. Don't take chances with cheap substitutes.

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If you value the lives of yourself, family and friends, see that the name "Imperial Tire Co. of New York" is on your tires.

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34 x 4	23 77	31 09	37.75
36 x 4	24 71	32 94	40.25
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BALL
BEARING
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SHIELD**



ABSOLUTELY AUTOMATIC

Any position desired can be obtained without stopping car. This shield operates with more ease than any other, as it operates on

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Send for discounts.

Zig-Zag, - List, \$30.00

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9 in., 11 in., 13 in. SWING.

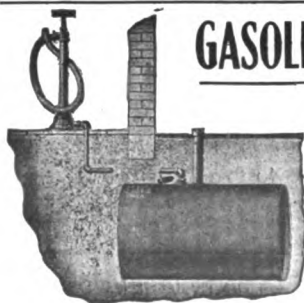
Suitable for fine accurate work in the garage, repair shop, tool-room and machine shop.

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A-1

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QUICK SELLERS, BIG PROFITS
AGENTS WANTED EVERYWHERE
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LEAKY TANKS ARE
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FOR AUTOMOBILES
TRUCKS AND BOATS
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Not long since we received an order for one thousand Jacks from one of the leading Auto Supply Houses.

Write us for our latest price list.

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Smethport Full Value Inner Tubes and Reliners Are Guaranteed To Give Satisfaction.

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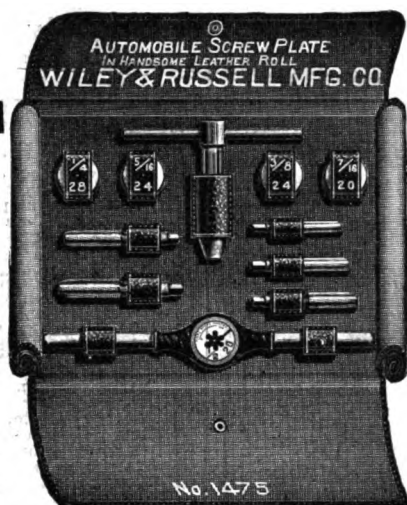
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No. 1475.

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A handy and convenient set of stocks and dies at a very low price.

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Lettered on outside in gilt.



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(PIPESTONE INSULATION)

LIVE-WIRE

(PORCELAIN INSULATION)

TWO NEW ONES

INDIAN Pipestone Insulation

The same pipestone from which the Indians have for generations made their pipes.

The Ideal Insulation for Plugs. After it has been chemically treated by our patented process, it cannot crack from heat, will not oil soak or soot.

We guarantee the INDIAN for 5 years.

Price, Each \$1.00



LIVE WIRE Porcelain Insulation

The porcelain core in this plug is not only the very best in quality, but is also over twice as large as the average core. This assures greater resistance to electrical current and breakage. Core is one piece "petticoat" type. Made with three standard threads. All parts interchangeable. Lots of style to this plug.

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Are what are needed to cut good threads, and you can always have them if you use a



"DUPLEX" Die Stock Set

The dies in these sets are easier to sharpen than a knife; this fact enables you to get the full wear out of them. A. L. A. M. and other standards of threads.

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THE HART MFG. CO.

1362 E. 3rd St., CLEVELAND, O., U. S. A.

Mr. AUTOMOBILIST: Do you read the newspapers?

Of course we know you do. We only put the question to attract your attention. As you do read the papers and are fully posted on everything up-to-date that is going on, we wish to remind you of the articles which are appearing constantly in reference to correct air pressure in your tires. All the tire manufacturers are laying great stress on the importance of having tires pumped to the pressure that they advise, but in order to be sure you follow their directions you must have a good Tire Pressure Gauge.



The SCHRADER UNIVERSAL TIRE PRESSURE GAUGE

has been submitted to every tire manufacturer in this country and we have their written approval of it. In most instances they tell us they consider it the best Gauge on the market. We are making this Gauge just as carefully as our sixty-six years of experience in manufacturing brass goods has taught us and every one of our Gauges is backed by our guarantee, so if you are not satisfied with our Gauge you need not keep it.

The great distinctive feature of the Schrader Universal Tire Pressure Gauge is that the pressure Indicating Sleeve remains exactly at the place it has been put by the air pressure in the tire when the Gauge is applied to the valve, thus making it possible to read the Gauge after it has been removed from the tire. After the pressure has been ascertained push the Indicating Sleeve back into the Gauge by the pressure of your finger. The construction of the Gauge is such that the Indicating Sleeve cannot be pushed beyond the proper figures, through sudden admission of air under high pressure into the Gauge. This feature is of the greatest importance. If you buy a Gauge you want to get one that is going to be right at all times. This Gauge records pressures accurately whether it is used with the valve at the top of the wheel or at the bottom.

Ask your tire maker, jobber or dealer to show you how it works. If they have none in stock enclose One Dollar in an envelope with your address and the Gauge will be sent you immediately by

A. SCHRADER'S SON, Inc.,
28-30-32 Rose St., New York City
Descriptive circular on application.

THE IMPROVED HART GIANT PUMP THE BEST TIRE PUMP



HART PUMP
Special Geared Type

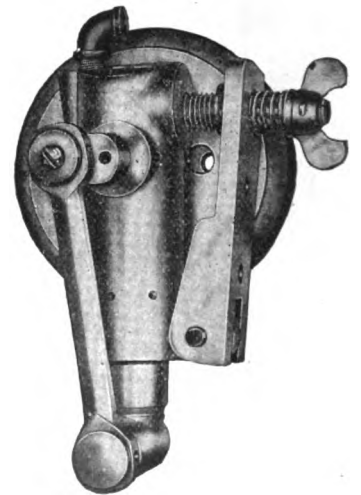
Let us explain *WHY* it is best. It is built in a machine shop by skilled machinists—construction best possible.

It is positively guaranteed for one year free from any mechanical defects and will pump 90 lbs. of air into a shoe in three minutes or less.

We challenge other pump makers to show any pump on the market to do the same amount of work as quickly and in as correct a manner as the Hart Giant Pump.

We ask readers to give us the privilege of giving them a full explanation.

*Write now for descriptive circular
and prices*



ORDINARY HART PUMP
Directly applied to Fly Wheel

HART & WIDDER CO.

511 West 21st Street

NEW YORK CITY

TELEPHONE, 1687 CHELSEA

AGENTS WANTED

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING.

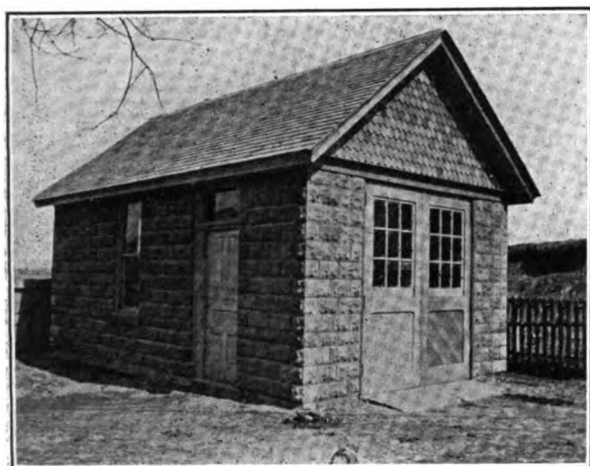
VOL. XI, No. 4.

NEW YORK, JUNE, 1911.

PRICE } 10c. PER COPY
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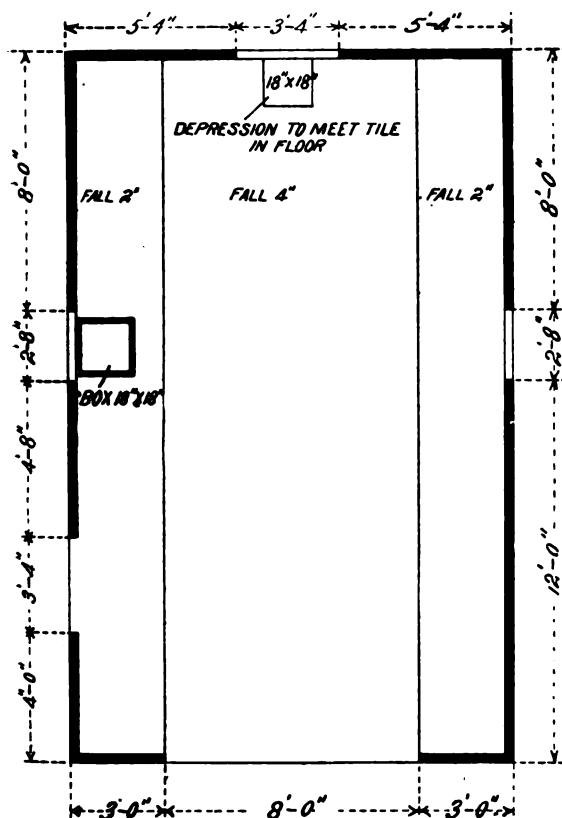
This Garage Cost But \$378.

From Chris A. Voelker, Jr., Iowa.—Enclosed please find plan, picture and specifications with bills for



Mr. Voelker's Garage.

erecting a private garage, the total cost of which is \$378, without painting.



Floor plan of Mr. Voelker's Garage.

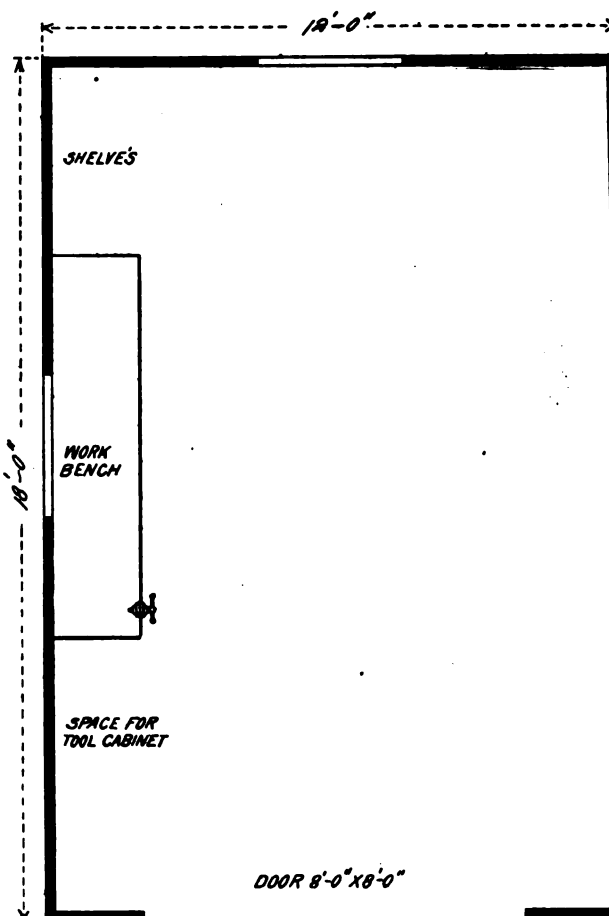
Total for the mill bill, including doors, transoms, windows, etc. \$60.15

Total lumber bill	55.27
Tin work .....	.75
Hardware	4.00
Concrete work, including cement blocks, cement floor, masonry labor and carpenter work	258.00

Total\$378.17
The garage is fireproof in every respect.

Garage for Five Passenger Car.

From John Holbrook, New York.—I send you a draft of a private garage I built last September for my five passenger car which makes a very convenient

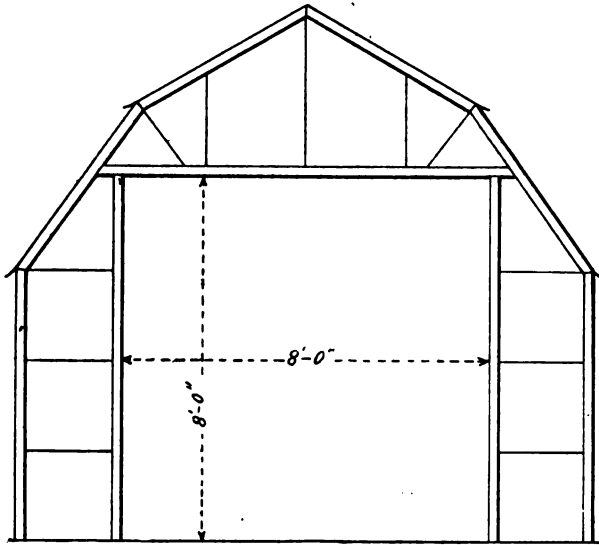


Floor Plan.

and inexpensive building, keeps the car better than any town garage and saves expense. It will be readily seen that the trip roof will give an eight-foot door with shorter posts than the common pitch. It also makes a very neat looking building. I built mine 12x18 feet, which gives room for a work bench, shelves and place for a tool cabinet. The first pitch is 17x12. The second pitch is 8x14. This pitch will answer any building from 10 feet up.

The following is the material used:

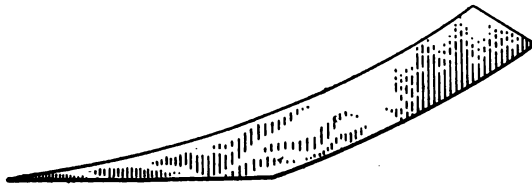
Two sills 18 feet long, 2x4. Two plates 18 feet long, 2x4. Two end sills 12 feet long, 2x4. Four corner posts 6 feet long, 4x4. Twenty side studs 6



Front Perspective.

feet long, 2x4. Eighteen end studs 12 feet long, 2x4. Ten pair rafters, two feet centers, 2x4. Sheeting for the sides 240 feet, for the ends 290 feet, for the roof 360 feet, and 3,000 shingles.

For the floor I used 6 parts of gravel and one of



Rafter Tail.

Portland cement. I used 8 inch railroad cornice. I send you an illustration of what I used for the rafter tails.

Removing Spattered Oil.

One problem that car owners have had to contend with considerably within the last couple years, has been the oiling and asphaltting of roads. A car driving over a freshly coated road is bound to become spattered with oil or asphalt. The oil can be easily removed by washing with soap, but never allow asphalt or road composition to harden on your car. Take it off while it is fresh. If it is once allowed to harden then nothing can take it off without taking the finish along with it. Wash the car with soap while the asphalt is fresh.

Test Your Goggles.

When selecting goggles, move each lens in turn before the eye. If an object seen through either appears distorted, it shows that the refraction of the lens is irregular, and such should be discarded, as they are injurious to the eyesight.

Keep the Tire Valve Caps On.

Never allow a tire valve to remain uncovered; if the cap be lost, secure by a piece of leather or rag and a rubber band or string round the stem. If dirt is allowed to enter, a leaky valve is bound to result.

LOSS OF POWER.

Some of Its More Common Causes and How to Remedy Them.

From J. N. Bagley, Kansas.—Loss of power in the motor car is nothing more nor less than a loss of dollars and cents, but many do not consider in that light. Nevertheless, it is a fact. An engine that loses power consumes the same electrical energy as when working at its best while the fuel consumption will very likely be increased and overtaxed in an effort to bring the speed of the car up to conditions that it has been in the past. Therefore, it behooves one who wishes a satisfactorily working machine and to keep the expense down to look after these things as soon as they are noticed.

Trouble hunting for the experienced is not such an unwelcome or difficult task as for the novice. There are many things which might cause a loss of power in the motor car and among some of the most common are poor compression, faulty ignition, and poor carburetion. Many people imagine if a little gasoline gives good power a little more will give more power. This, however, is a mistake, for a mixture that is not correct will not give good results. If the mixture contains too little gas it will not have the expansive power to drive the piston out with any force, and on the other hand if it contains an excessive amount of gasoline its expansive force will not be completed before the piston reaches the end of its outward travel, consequently the mixture is still burning when expelled from the combustion chamber and gives forth a strong odor and black smoke. The maker of the car gives instructions for adjusting the carburetor and the novice should follow them very closely if he wishes to get the best results. However, experience is a good teacher for carburetor adjustments.

The simplest things are not the ones with the fewest parts, and if a close examination be made it will disclose in the automobile an assemblage of relatively simple units or parts, all working in harmony. Some of the simplest things may give any amount of trouble. In fact they look so simple that the person diagnosing the case will pass them up without giving a thought to such being the trouble.

As already stated the chief power loss comes from poor compression and may result from any of the following: Leaky valves, broken or worn rings, a scored cylinder wall, weak valve spring failing to hold the valve securely to its seat, a spark plug not being screwed down tight, or a gasket blown out. When the compression is poor the explosion pressure is decreased and instead of the power or expansion being all against the piston, it escapes around the rings to the crank case, or through the valves to the open air. In this case a part of the charge taken to the cylinder is wasted. Therefore, it may be readily seen if this is kept up for any length of time the mileage will be decreased, although the same or even a greater amount of fuel will be consumed.

In case the valves leak it will be necessary to re-grind them until all spots and pits are moved and the valve shows a bright ring all the way around. After grinding the valves until they seat perfectly, the end of the stem may come too close to the lift. The proper distance between the lift and the valve in most cases is $\frac{3}{32}$ of an inch. If the valve stem comes close up against the end of the lift as soon as the valve becomes hot the metal will expand sufficiently to hold the valve open and the result will be little or no compression. In case the valve springs

are weak and new ones are not at hand old springs may be stretched until they give the required tension. In case the rings are worn until there is an opening between the ends, they must be replaced with new as a great amount of compression will thus escape past the rings to the crank case. This not only causes a loss of power but heats the oil up in the crank case until the bearings do not have the required amount of lubrication. If there is a loss of power in a new car it is not likely to be caused by a loss of compression, for lost compression is a disease that does not come on at once but gradually. If the new car has a loss of power it will very likely be found to be caused by a faulty mixture or a defective ignition apparatus—not in manufacture but in adjustment.

Many times the rings become dirty, causing them to stick in their guides. In this case the compression would not be good as the rings would not expand to the cylinder walls and the compression would pass to the crank case of the motor. A moderate use of kerosene in the cylinder that gives the trouble will keep the rings free from the carbon deposit. In case the lubrication is skimped the cylinder will wear very rapidly and it is only a matter of time when it must be rebored, while if properly lubricated a cylinder will run many years without showing serious grooves that will effect the compression to any great extent.

Next to poor compression from a power standpoint comes ignition troubles. These are the first things to be looked for if the engine stops or suddenly loses power. Since the magneto has become so popular ignition troubles are nothing compared to what they were. The modern magneto demands very little attention and when delicate or serious adjustments are to be made it is best to refer the matter to the makers. In using the magneto it should not be taken for granted that there will be no electrical troubles for there still remains, loose connections, short circuits, spark plugs, timer and vibrator troubles. All connections should be made with pliers as finger pressure will not stand the jolts and jars that they are subject to in road travel. The ground wire, an important factor, should not be overlooked. It should be fastened to the frame of the motor at some point where it can be readily seen without crawling under the machine. Short circuits will occur in either the primary or secondary wiring as well as in the storage battery. Storage batteries short internally through the jarring of their parts. Aside from the above we might consider broken wires as one of the troubles that are hard to locate because of the insulation causing the outside appearance to remain the same. Vibrator points become rough and stick together, in which case they must be smoothed or dressed with a file or emery cloth. Emery cloth will be the best, owing to the fact the file cuts the point away very fast. After the points have been smoothed it will be necessary to readjust them. Experience will be found the best teacher for coil adjustments, but in every case they should have a clear singing sound, resembling the buzz of the bee.

If the points of the coil were adjusted too close the battery consumption would be increased without an adequate return of usefulness. And again, if the points were set too loose the motor would miss or skip explosions when running fast. The condition of the batteries should be always known before starting on a long trip for a battery that will start the engine and run it for a short time might give out the first mile from home. Every driver or owner of a car should provide himself with a battery ammeter and voltmeter and know the condition of the battery before attempting a long drive.

A freshly charged storage battery should read in the neighborhood of 2.3 volts to the cell, different batteries give different readings, therefore, it is important that the user knows the voltage when the battery is charged as well as knowing the lowest voltage at which it is intended to work. A storage battery should not be allowed to remain in a discharged state as it is very harmful to the battery. Dry cells should show an amperage anywhere from 17 to 28 and 30 amperes to the cell, depending on the particular make, as some cells when new have a higher amperage than others, but any of them regardless of the make should not be used after the amperage falls below 5 or 6 amperes to the cell. If an extra set of dry cells is carried to use in case the storage battery gives out while on the road they should be in an upright position for new dry cells that are piled into the box "any old way" will soon run down if they are not connected into the circuit. This may not seem to make a difference, but the writer has made a few experiments along this line and found that the battery sitting in an upright position while in use will outlast two sets of cells if thrown about in a box just as they happen to come. The dry cells should be packed in the box until they cannot bounce about as they will occasionally get in such position that two zinc poles come together and short, causing the engine to miss-fire, possibly for but two or three times until they shake apart. Then all will be well for a time when the same thing happens again. Just such little things as these have worried many a novice until he has come to the conclusion that the car he has is no good. The writer knows of a case of this kind where an expert laid the cause to the coil and the owner of the car was induced to buy a new coil, and later a new set of valves throughout, still the engine worked the same. After a time the would-be "expert" came to the conclusion that the engine was not properly designed and the discouraged owner ran the machine into the garage for keeps. Some two months later a cousin of his came to pay him a visit and being of a mechanical turn of mind and reasoning things out, he found the trouble. The car has been running ever since and this man's opinion of the "expert's" advice is not exactly known. On one other occasion a mail carrier had a small runabout which needed a new engine. After it arrived he concluded to have the "expert" come and install the engine. It was not long until the engine was connected ready to run and trying to start it there seemed to be no compression. The "expert" again tore the engine down, all the while trying to tell the owner how careless they were at the factory about assembling the engines. After the engine was finally torn down and the parts scattered about the owner discovered that he had been trying to start the engine with the spark plug still in the box in which it was shipped. Is it any wonder the engine did not have compression?

The carburetor is blamed for many things of which it is not guilty. Its adjusting screw is twisted about from one side to the other when in fact something else is at fault. The carburetor will when properly adjusted give little or no bother, but when dirt collects, interfering with the flow of gas from the tank, the power is affected, therefore, it is best to look to the straining of the gasoline than to the adjustment of the carburetor unless it is absolutely necessary. The automobile engine of to-day if properly and regularly cared for can be depended upon to deliver its rating of power well up to its installing point.

ELECTRICAL IGNITION.

Different Forms of Apparatus and Where There Is a Chance for Improvement.

From Sydney F. Walker, England.—The writer proposes to examine the working of the different forms of electrical ignition apparatus, and to point out as far as possible the lines upon which improve-

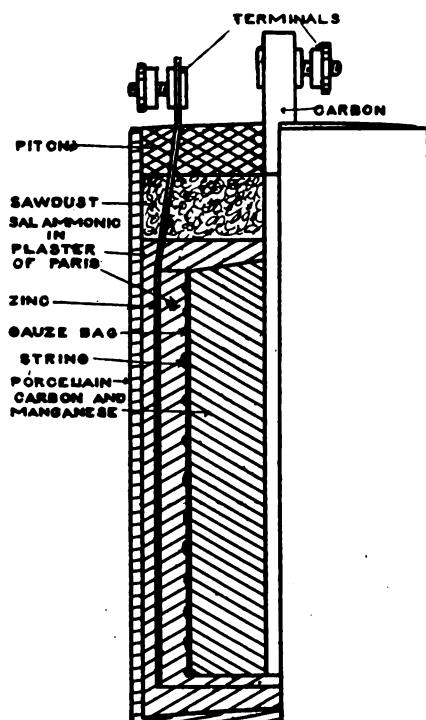


Fig. 1—Vertical section of Dr. Lessing's dry cell, showing the arrangement of the different elements.

ment should take place. As readers of *The Automobile Dealer* know, the earliest form of apparatus was the spark coil, worked by dry cells. The dry cells gave way to secondary batteries, and later the whole apparatus gave way to the magneto ignition.

The dry cell, though it deservedly possibly fell into disgrace, has a great deal to recommend it, and the writer believes, if it is arranged on right lines, it would do very good service and answer in a great

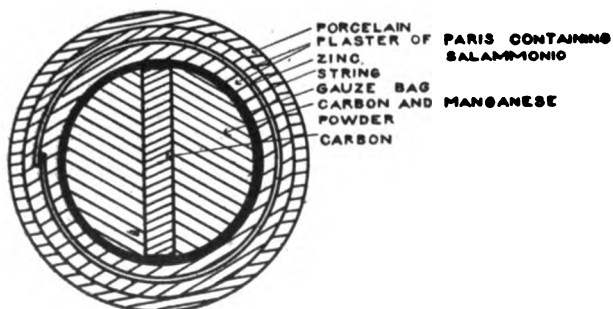


Fig. 2—Horizontal cross section of Dr. Lessing's dry cell.

many instances better than accumulators. The difficulty of the dry cell is its liability to break down without warning. This liability can easily be provided against. The writer has had a very long experience of the Le Clanché battery, of which the dry cell is a modification, and his experience has been that a great deal of very good useful work can be obtained out of the cell, if certain principles are adopted. The Le Clanché cell, it will be remembered, consists of zinc and carbon, the zinc standing constantly in a sal ammoniac solution, and the carbon being surrounded by

a mixture of oxide of manganese and carbon. In the working of the cell, the solution of sal ammoniac is decomposed, zinc chloride and zinc oxide being formed at the zinc plate, and hydrogen gas and ammonia gas being delivered at the carbon plate. The ammonia gas, if allowed to, comes away freely. When a Le Clanché battery is working hard, the ammonia gas may be smelled some distance away. The hydrogen gas, being in a very active state, seizes upon a portion of the oxygen contained in the oxide of manganese, reducing it to a lower oxide, and forming water. There are other secondary actions. The ammonia gas passes back into the solution of sal ammoniac, and forms with the zinc chloride and zinc oxide, what are termed secondary salts, zinc-ammoniac chloride, and oxy-ammoniac chloride. These secondary salts are the cause of a good deal of the trouble in Le Clanché cells. They tend to crystalize out in the pores of the porous cell that is used with the ordinary

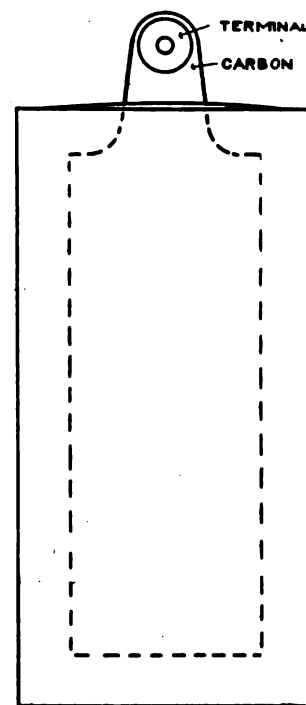


Fig. 3—Sectional diagram giving a general view of Dr. Lessing's dry cell.

Le Clanché battery, filling up the pores, preventing the passage of liquid through them, and reducing the power of the cell. In addition, if the battery is worked too hard, if too large a current is taken from it, the hydrogen gas has not time to become neutralized, and the ammonia gas has not time to get away, and consequently the cell begins to fail.

The one secret of working the ordinary Le Clanché battery successfully is to make the cell large enough for the current it is to furnish. What are termed wet Le Clanché cells are gradually being displaced by dry cells, even for bell and telephone work; but in the days when they were used almost universally, they were made in three sizes, pints, quarts and five pints. The present writer used to make a gallon cell. It was found in practice, that for any given work, the quart cell would outlast the pint cell about three times, and the five pint cell would last still longer, while the gallon cell which the writer introduced, would stand almost any amount of the work it was put to in those days.

The writer has entered into these details, and this explanation of the working of the Le Clanché cell,

because it gives the secret of success with the dry cell.

The early dry cells, which were introduced over twenty years ago, were complete failures; but as usual in so many other cases, the experience gained has gradually enabled the arrangements to be im-

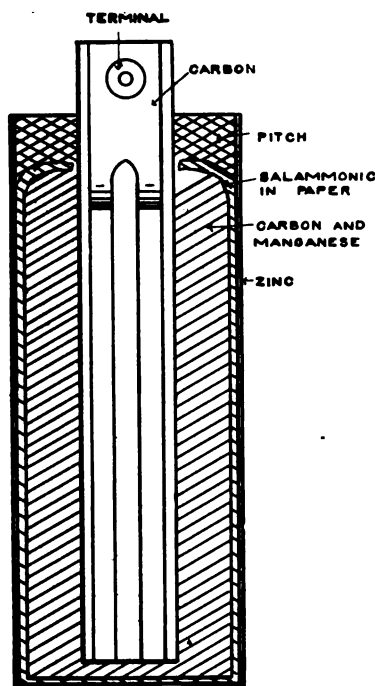


Fig. 4—Vertical section of another form of dry cell.

proved, and the dry cells of the present day stand ordinary work, quite as well as the very largest sized Le Clanché cells did. The work, however, of electrical ignition apparatus is very much more severe than that of either telephones, electric bells, or electric mine signals, the other uses to which cells are put. Nevertheless, the same rule holds good, it is a question of size. In the dry cell all the parts and all the chemical actions of the wet cell are present. There must be a zinc, which is usually made in the form of a cylinder, inside an outer containing jar. There must be a carbon plate or rod; and there must be a supply of salamoniac, or some salt that will answer the purpose equally as well, and a supply of oxide of manganese. The supply of salamoniac is carried in plaster of Paris, or some similar substance, sometimes in paper, and the oxide of manganese is carried in the form of a block or powder, usually compressed around the carbon plate. The carbon plate with the compressed block of oxide of manganese and carbon around it, is again a modification of what was termed the agglomerate form of Le Clanché cell. The oxide of manganese in the dry cell is crushed to a fine powder, and mixed with carbon also crushed to a fine powder, the two being sometimes moulded together around the carbon plate, by hydraulic pressure, some glutinous body being added to give the necessary adhesion, and sometimes filled in a close powder, partly composed. The improvement which has taken place in the staying power of the dry cells since they were first brought out, is due I think principally to more careful selection of the oxide of manganese, the rejection of the impurities which are found with it, and the more careful dealing with the whole thing. The oxide of manganese occurs naturally as an ore, and the percentage of pure oxide varies from 30 up

to 90 per cent. The difference between a cell made up with 30 per cent. oxide, and 90 per cent., in staying power, is something startling. A great many years ago, the writer had fitted up an electric signal in a coal mine, worked by the second sized Le Clanché cells, which he had made up in his own works. After the signal was fitted, he found that there was a large leakage current, and he was in great fear that the battery would run down very quickly. To his agreeable surprise it stood well, and he found on going into the matter, that it was due to his having been exceedingly fortunate in his purchase of oxide of manganese for that batch of cells. Needless to say, he followed the hint in later batches. The dry cell also which is to be successful, must have pure water used in the solution of salamoniac, with which the plaster of Paris or other carrier is impregnated, the salamoniac itself must again be as pure as possible. The purer the salamoniac the less are the chances of the formation of secondary salts. Again, salamoniac varies very considerably. There are two distinct substances on the market, apparently the same, muriate of ammonia, and salamoniac. They are both prepared by the same chemical process, from the liquor which comes away from the gas works. Muriate of ammonia is not subject to any purifying process at all, salamoniac is. Muriate of ammonia is of course very much cheaper than salamoniac. The more carefully the salamoniac is purified, the better is the chance of the cell standing. The writer believes that in the dry cells which are now standing so well for general work, this point has not been lost sight of. But beyond all this, the question of size comes in, and here in connection with

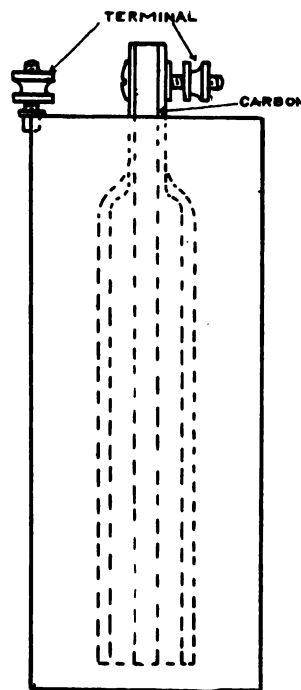


Fig. 5—Sectional diagram giving a general view of dry cell shown in Fig. 4.

the ignition of the charges in motor and aeroplane engines, the number of cylinders has a most important bearing. A battery which will keep up to its work when igniting the charge of a single cylinder running at say 1,000 revolutions per minute, will break down very quickly if it is put to ignite the charge say of a four-cylinder engine. A little consideration will show how this is. With a speed of 1,000 revo-

lutions per minute, ignition takes place 250 times per minute. That is to say, there are 250 currents of a certain duration, sufficiently long to thoroughly magnetize the core of the induction coil called for, with the single cylinder. With a two-cylinder engine, 500 currents per minute are called for, of the same duration; with a four-cylinder engine 1,000 currents; with a six-cylinder engine 1,500 currents, and with an eight-cylinder, 2,000 currents. Following the matter back, the current demanded by the single cylinder engine has say approximately quarter of a second to discharge itself. The hydrogen gas formed has that time in which to secure its necessary quantity of oxy-

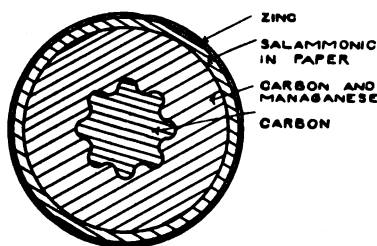


Fig. 6—Horizontal cross section of dry cell shown in Figs. 4 and 5.

gen, ammonia has the same time to diffuse itself, and the salts formed at the zinc have the same time to dissolve and leave the zinc plate clean.

It may be mentioned *en passant*, that the dirtying up of the zinc plate is another source of failure of the Le Clanché or dry cell. If the zinc is not pure, and if it is not amalgamated, covered with a thin film of mercury before putting into use, and if it is uneven in form, what electricians call polarization is set up, which means a back pressure acting at the zinc plate, reducing the strength of the current.

With the two-cylinder engine, running at the same speed, all of these operations have only one-eighth of a second in which to be accomplished; with the four-cylinder engine they have only one-sixteenth of a second, and so on. When again an engine, whether of one, two or more cylinders, is running at higher than the usual speed, say it is running up to 1,200 or 1,500 revolutions, the time in which the different operations have to be performed is again lessened. All this means that the cell breaks down. It depends entirely upon the way in which the cell has been constructed, upon the quality of the manganese, of the salamoniac, of the carrier for the salamoniac, of the zinc, and of the way the whole thing is arranged, and upon the size of the cell, at what number of currents per minute the secondary actions within the cell begin to get the better of the primary actions. With every form of cell, however well made, and with every size, there will be some number at which failure commences, but the larger the cells, and the more carefully the whole of the details of the manufacture have been carried out, the greater is the number of currents they will supply without feeling it.

In the writer's opinion, it is doubtful whether any dry cell would stand up to the work required for an eight-cylinder engine. And it follows almost as a matter of course, that it is not often required to do so. The proprietor of an eight-cylinder engine car, has usually plenty of facilities at his command for charging his accumulators. The dry cell however would probably be a great boon to small low powered cars, single and two-cylinder cars, of which it is more than probable that many will be on the market before long, as motoring becomes more and more popular. The

motor bicycle is becoming more and more popular among professional men, and business men who have to get about a good deal. But as the writer understands, there is a distinct tendency to substitute a light runabout car, something on the lines of the horse-drawn dog cart, for the motor bicycle. For the motor bicycle, and for runabout cars, especially those used in country districts, the dry cell should be a great boon, and it should do its work well, if it is well made, and sufficiently large. Further, if it is tested at every opportunity, plenty of warning will be given for changing the cells, and it should be an easy matter to carry a spare cell or two on the car. Figs. 1, 2 and 3 are sections of Dr. Lessing's cell, which the writer has found stands up to its work very well; and Figs. 4, 5 and 6 sections of another form of dry cell.

Knowing When a Dry Cell Battery Is Going to Fail.

It is a very simple matter to ensure having plenty of warning of the failure of a dry battery, providing that it is well made. The portable volt meters which are on the market, if properly used, will always give plenty of warning. Care must be taken in using them. The points at which tests are made, the terminals of the cells, should be scraped clean with a penknife, and the ends of the voltmeter wires, which should also be clean, should be pressed very firmly upon the cleaned places on the dry cells. Each cell when first set up, should theoretically give 1.5 volts on open circuit when not furnishing current. It is very rare that even the best gives more than 1.4 volts, and the bulk will usually give only 1.3 volts. A cell is usually good until it falls to about 0.5 volts; but each

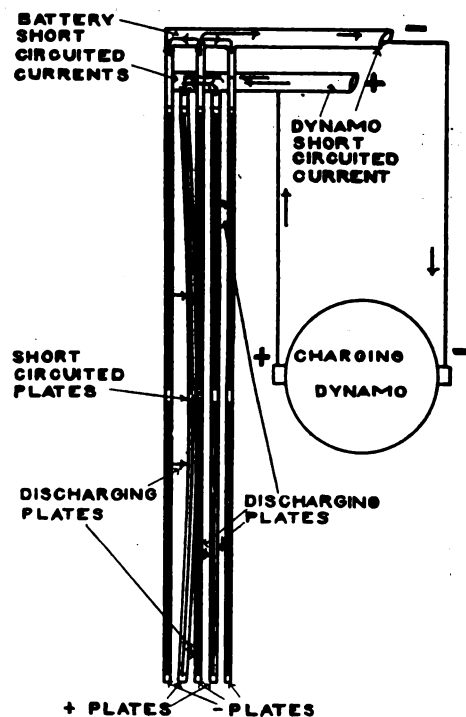


Fig. 7—Showing diagrammatically how a fault occurs in a battery cell by the bending or touching.

engine has its own idiosyncrasy. Each motor owner should know, as he can do by a little practice, when the battery as a whole has run down too far to ensure continuous ignition. If he is only going out for a short run, probably if all four cells give 0.8 each, he will be all right. If it is for a long run, he will probably be wiser to change all four cells if they are as low as this. It very often happens however, that one cell will be nearly run down, while the others are

giving a good current, and the run down cell will prevent ignition. Testing before going out will show the run down cell, and it is then easily replaced. It is always wise to test all cells used for ignition work, before going out, after the return, and if it can be done, when any stop of any duration is made. With both secondary batteries and dry cells, command of them is obtained by frequent testing.

The Secondary Battery.

A great deal that has been said of the dry cell, applies to the secondary cell. The secondary cell or

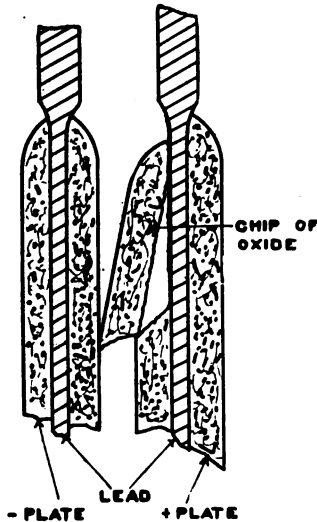


Fig. 8—Showing diagrammatically how a short circuit occurs in battery cell by a chip of oxide making connection between two plates.

accumulator hardly needs any description. It consists of lead plates suspended in a solution of dilute sulphuric acid, alternate plates being pasted with a low oxide of lead, and the remainder with a higher oxide. In the working of the battery, oxygen is alternately transferred from the plate that is pasted with a higher oxide, through the electrolyte, the dilute sulphuric acid, to the plate having the lower oxide, and vice versa. Again the staying power of the cells depends upon their construction, and upon their size, and more than the dry cells, upon their treatment. Modern accumulators are very much better made than those of ten and more years ago, and will stand the rough and tumble of a motor car, better than the earlier ones; but the same reasoning holds with reference to them. If the lead plates are not sufficiently stiff, if the paste is not made to form really part of the plate, if the paste itself is not pure oxide, if the sulphuric acid contains salts of iron, as it sometimes does; all of these things lead to an earlier breakdown of the battery. Further, if the cells are allowed to run down below a certain figure, the safe pressure is 1.8 volts per cell, sulphate of lead is apt to form between the paste, the more or less loose material, and the lead plate itself, the carrier; and when the cell is recharged, the sulphate is formed into fresh oxide, at the expense of the plate. Literally, a battery which is not properly fed with current, or which is exhausted by an over draught of current, feeds upon its own bones, the lead plates. The result of this is, the plates become more or less disintegrated, and tend to break up. There is also a trouble that may arise from the same initial cause. If the plates are weakened by the formation of sulphate, or if they are not made sufficiently stiff originally, the expansions and contractions which take place in the oxides during the working of the cells, may cause a connection between

two of the plates, with the result that the cell gives no useful current for ignition purposes, and it quickly exhausts itself. In many forms of modern accumulators, it is usual to add a little antimony to the lead, in order to stiffen the plate. This is a good thing if it is not carried too far. Stiffness in the plate is good, brittleness is bad. Too much antimony will make the lead brittle, and the evil mentioned above, the breaking up of the plate, may ensue. In the working of the secondary battery, the oxides of lead which do the same work as the zinc and carbon and salamoniac and oxide of manganese do in the dry cell, expand and contract very largely. They require space to enable them to do this, and in the last forms of modern batteries, space is given them. If however there is not space, or if the plates supporting them are weak, there is a strong tendency to bend the plate. There is a further tendency for the oxide itself to chip off in scales, and either to form on the bottom of the cell, or occasionally to lodge between the plates. Most modern batteries have separators of some kind between the plates, to ensure that there shall be no lodgment, and there should also be a certain space between the lower edges of the plates, and the bottoms of the containing vessels, upon which any chips of oxide can fall, without doing any harm. In the charging of the battery also, a certain amount of hydrogen gas is given off, which must either be dissolved in the electrolyte, or must come away freely. Care should be taken that provision is made to ensure that when charging, the hydrogen is able to get away freely.

Again assuming that the battery is well con-

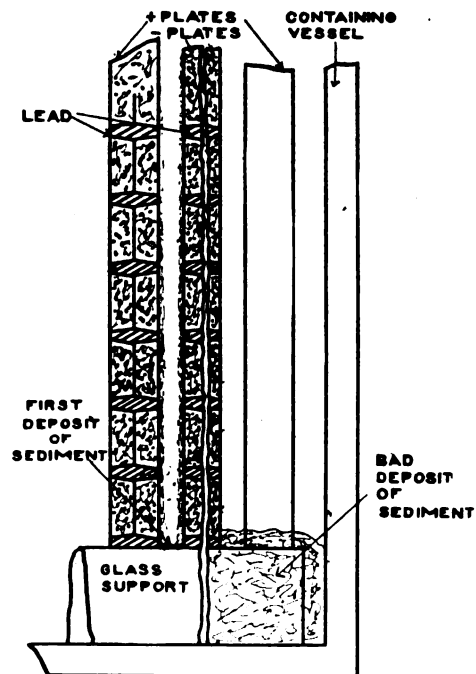


Fig. 9—Showing diagrammatically how a short circuit occurs in a battery cell by the deposit of oxide on the bottom of the containing vessel.

structed, that the plates are stiff, that the paste has been properly put on, and that the formation of the oxide, where it is formed by the aid of a current of electricity, has been properly carried out; the staying power of the battery depends upon its size. The same reasoning applies, as with the dry cell, but in rather a different manner. The well-made secondary battery will usually respond to a heavy call; that is to say, if a larger current than usual is demanded from it, it will furnish it, without breaking down imme-

diately, as a dry cell might; but the faster the current is taken from it, the smaller is the total number of ampere hours, the total capacity that it will furnish. In all of these electro-chemical actions, the best results are obtained when the current passing is small. The larger the current in proportion to the surfaces, etc., employed, the more difficult it is to keep the action continuous, and the more ready it is to fail. Taking again the case of the single cylinder engine running at 1,000 revolutions per minute, the ordinary battery provided will easily furnish the 250 currents required, and will keep up to its work well, for the full time stated by the makers. But with a two cell engine, the rate of delivery of current is twice as great, with the four cell four times as great, and so on, and the total available discharge of the battery becomes steadily less, for a given size, as the number of cylinders increases. Fig. 7 illustrates the fault men-

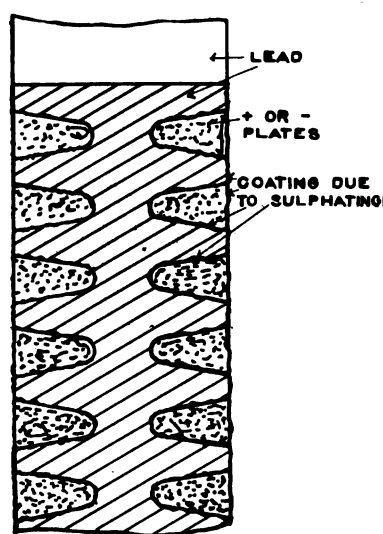


Fig. 10—Showing diagrammatically the formation of lead sulphate as a skin between the oxide and the lead supporting plate.

tioned, a connection between secondary batteries by bending or buckling the plates. Fig 8, a connection between plates by a chip of oxide lodged between them. Fig. 9, a connection by oxide on the bottom of the cell, and Fig. 10 to the formation of sulphate of lead on a plate, between the oxide and the plate. The secondary battery should be tested frequently, as well as the primary. Frequent tests give warning of fault.

(To be continued.)

Danger of Vibration.

Constant vibration of the car will loosen, open or shake off anything that is capable of being jarred out of place. The mischief that can be accomplished in this way is sometimes surprising. Cocks and taps should always be carefully watched, for if they are not tight they will surely jar open. The relief cocks on the cylinders will, of course, give instant warning when they are opened by the hissing of the escaping gas; but drain cocks in oil chambers will quietly allow the last drop of oil to run off, leaving the bearings or gears without lubrication. Drain cocks in the water system will also do their mischief silently, the motorist knowing nothing of what is happening until his engine begins to overheat. Cocks and taps should therefore be adjusted so that they turn stiffly, and they should be placed where they will be as free as possible from the chance of an accidental knock.

ROADS FOR AUTOMOBILES.

How to Construct Them, the Material to Use, and the Best Dust Layers.

From Walter L. Page, director U. S. Office Public Roads.—Before discussing the construction of automobile roads it may not be amiss to consider briefly the action of automobile traffic on roads as compared with horse-drawn traffic. Under horse-drawn traffic a well constructed macadam road wears out in two ways: (1) by actual wear of the road material due to impact and abrasion of iron shoes and iron-tired wheels, and (2) by disintegration of the road surface apart from the wear of the road material. The first form of wear actually reduces the second by constantly forming new binding material to replace that which is removed. Where a suitable road stone is employed this replacement keeps abreast with the removal of the products of wear and the road wears out slowly and uniformly. The cost of maintenance is, therefore, kept within economical limits. On macadam roads and in fact on any type of road the rubber-tired automobile causes little wear of the material of which the road is constructed. Unless, however, the individual fragments or units of which the road is composed are firmly held in place, the powerful shearing action of the driving-wheels displaces these fragments and so causes rapid disintegration of the road surface. This action increases with the speed and weight of the vehicle, and is most pronounced on curves, owing to skidding of the machine at such places. The use of chains and other anti-skidding devices hastens somewhat the wear of the road material.

Road Construction Conditions.

In the construction of automobile roads there may be one of three conditions to meet:

(1.) The road may be subjected to automobile traffic only, in which case excessive speed is often encountered. Speedways and race tracks are examples of such roads.

(2.) The road may be subjected to moderate automobile traffic and light horse-drawn traffic, as in the case of parkways and pleasure drives.

(3.) The road may be subjected to mixed traffic, including automobiles and heavy horse-drawn or teaming traffic as in the case of many of our country and suburban highways.

While each of these conditions can be successfully met by different forms of construction, there are certain fundamental principles which should never be lost sight of in attempting to meet them. For instance, in roads subjected to horse-drawn traffic a certain degree of resiliency is highly desirable, while in those subjected to automobile traffic only, resiliency is a minor consideration, owing to the cushioning effect of the rubber tires. Therefore, an automobile speedway or race track may well be constructed of some rigid material, such as Portland cement, concrete or brick. Roads constructed of such materials are particularly well adapted to withstand the shearing action of machines driven at high speed, for the individual parts are held rigidly in place by a powerful chemical set in case of cement and by a mechanical set in the case of bricks or blocks. If such roads are well constructed and properly banked at curves, they should be practically unaffected by automobile traffic and if well crowned and drained should last indefinitely, providing due precautions are taken to prevent expansion or contraction cracks, by placing expansion joints where needed. Macadam or gravel roads sur-

faced with a good grade of bituminous binder may give temporary satisfaction for this class of traffic, but it is doubtful if either the bituminous surfaced or bituminous constructed road will eventually prove as economical, owing to the necessity for more frequent treatment or repairs. In this connection it will be of interest to compare the cost of the brick-paved track at Indianapolis with other large automobile race courses during a period of five or ten years.

Materials Suited to Traffic.

The very factors that make cement concrete, bricks and blocks desirable materials for the construction of strictly automobile roads cause them to be far from ideal materials for the construction of roads subjected to mixed traffic. Brick and cement concrete, being non-resilient, are hard upon horses and make noisy roads upon the impact of iron-shod hoofs. Such roads are, therefore, undesirable for parkways and pleasure drives. Besides this, all types of brick and block pavements are at the present time far too expensive for the average park and pleasure drive. Surface treated macadam and gravel roads are, as a rule, well adapted for the class of traffic here encountered, providing a suitable binder is intelligently applied. The roads are, as a rule, under constant supervision, so that it is possible to make a number of applications of the binder during a season, if necessary, without exceeding economical limits. The materials used in such treatment may be hygroscopic salts, oil emulsions or more or less fluid bituminous binders, according to specific local conditions which will have to be met.

Surface Treatment of Roads.

Hygroscopic salts, oil emulsions and very fluids oils and tars are employed mainly for the purpose of laying dust, but in so doing they protect the road to a great extent from the destructive action of motor vehicles. As long as the finer products of wear are retained upon the road in sufficient quantity to bind the coarse material fragments together the automobile can do but little damage. As soon, however, as these materials lose their dust-laying effect or are removed from the road the destructive action begins and if not quickly checked will cause rapid disintegration of the road. For this reason it is necessary that the treatment be made under competent supervision and at just the right time in order to secure economical results.

Hygroscopic salts, such as calcium chloride, are usually applied in solution and serve to intensify the dust laying effect of water. Oil emulsions, when applied by means of water which acts as a carrier, serve as dust layers after the water has evaporated. Certain types are, however, essentially greasy, and exhibit no binding value. This may also be true of the light petroleum and tar products, and when such is the case, more harm than good may ultimately result from their use, for surrounding the mineral particles with a film of grease they act as lubricants and gradually break up the already existing bond of rock dust. If they are not applied in excessive quantity, a season or more may elapse before their injurious effect is noticeable, and then the road will begin to ravel and disintegrate, although more than sufficient fine material may be present to serve as a binder under normal conditions. When this happens little can be done except to build a new road, for it is almost impossible to rebond the lubricated fragments even by the application of a good binding material. In the surface treatment of roads with oil or tar products, it is poor policy to

make use of a material even for dust laying, which will not also serve as a binder. Non-realization of this fact has undoubtedly been responsible for the failure of many surface-treated roads.

Besides the temporary binders or dust palliatives previously mentioned, good results have been obtained in the treatment of parkways with refined oil and tar products heavy enough to require heating before they can be applied. Such materials, if containing a good binding base, form a mat or carpet over the surface as they become incorporated with the dressing of stone chips, sand or gravel, which is given the road after their application. This mat takes up a considerable amount of wear, and at the same time protects the underlying surface from disintegrating. Until the point of saturation of the bitumen for the dust has been reached, the road will be practically dustless. This method of treatment should prove effective for at least one year to be economical. In some instances, the effect is of longer duration, depending largely upon weather conditions and character of traffic which the road receives.

Horse-drawn traffic is more destructive to these mats or carpets, than automobiles, particularly in rainy weather; if however, it is confined to light carriages and buggies, and the proportion of these vehicles to automobiles is small, thus they do but little permanent damage. In such instances the passage of a large number of automobiles irons out the marks of the hoofs and the grooves cut by steel-tired wheels almost as fast as they are formed.

Before leaving the subject of surface treatment, mention should be made of one other surfacing material which acts as a powerful temporary binder. This material is a bituminous binder which forms the subject of a later article.

Cleaning a Chamois.

After a chamois skin used for cleaning and polishing has been in service for some time it becomes dirty, as oil spots easily hold dirt and grit, which cut or scratch the polished surface instead of brightening it. The chamois may, however, be very easily restored to its original condition. First, it should be carefully brushed to remove any adhering dust. Then it should be covered with soft soap and left for two hours in a bath of hot water, to which a small amount of soda has been added. Next, it should be rubbed until it is perfectly soft and then washed in a weak solution of soda and soft soap in hot water, after which it should be allowed to dry. Chamois skins should never be rinsed in pure water, as it hardens them.

Care of the Car Body.

When coachwork of a car is new nothing but cold water should be used, as it hardens and preserves it, and therefore should be used freely and often. Nothing causes paint-work to get shabby more quickly, especially when new, than letting the car be put away with mud and dust on it, especially the former. Mud in drying acts as a very effective poultice, and, by capillary attraction, sucks and destroys the surface. Another reprehensible habit is making the wings do duty as a tool bench. How often do we see spanners, hammers, and tire levers, etc., flung on to the wings, to the detriment of their appearance. The same remark applies to the cushions of the car: greasy, dirty tools laid on the leather make stains which nothing can thoroughly eradicate.

PINS AND BOLTS.

Connections That Make Trouble and Rattle in Automobile Use and Wear.

BY JAMES F. HOBART, M. E.

A good deal of the rattle and not a few breakdowns are directly chargeable to loose pins, poorly fitting bolts and insufficient bearing surfaces of screws, studs and similar parts of automobile mechanism. Perhaps no better illustration can be made than is shown by Figs. 1, 2, 3 and 4. The first shows a form of pin connection which is sometimes found in automobile construction, but which is fast being relegated to the scrap heap where it naturally gravitates as does all inferior mechanical construction, movements and "contraptions."

With this form of pin connection, there will be constant wear and rattle from the time the job is done until it is worn out—and that will not be long. The form shown by sketch B, Fig. 2, is the better of the two, but that is poor enough. It will last longer, therefore rattle longer than Fig. 1. That is all that can be said in favor of this type.

The forms of pin connections shown by Figs. 3 and 4 will last as long as required. In fact, there is no wear out to them, as the parts may be renewed when necessary and there is no rattle for the lost motion can always be taken up as fast as it develops. It may now be in order to analyze the four forms of pin connections and to show why and wherefore they are as stated above.

The form of connection shown in Fig. 1, is perhaps the worst trouble-maker that ever "came down the pike." Its internal construction is as shown in Fig. 5. When the pin is new, it shows up like the sketch, a pin with a round head being placed through the two rods to be connected and held in place by means of

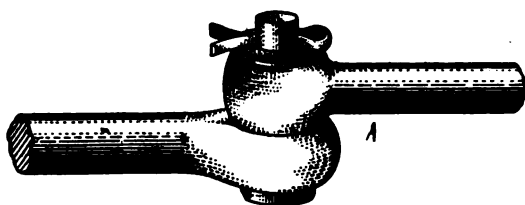


Fig. 1.

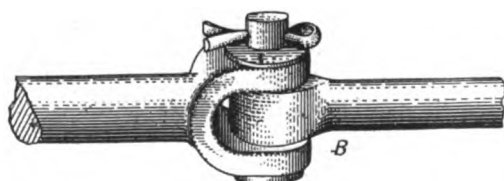


Fig. 2.

the cotter pin and the loose washer. While new, and before it has ever been used, this arrangement shows up well—on paper. The washer and the cotter pin keep the thing together and prevent the pin from working out. But when wear commences, another story is soon told.

Just as soon as pressure comes upon the rod there is a tendency to tip the pin in the direction shown in Fig. 5. Then when a pull comes upon the rod the pin will be tipped the other way to an extent depending upon the lost motion of the rod around the pin. To begin with, this must exist, although slight, but every time motion is reversed, the lost motion

increases and the first thing you know, things are as shown.

This is no fancy sketch. Indeed, it is drawn from actual practice and the writer has seen many a pin worse cut up than shown by the engraving. In fact, the cutting action proceeds and continues to get

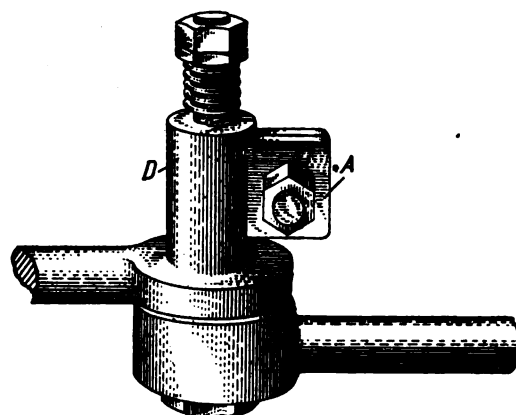


Fig. 3.

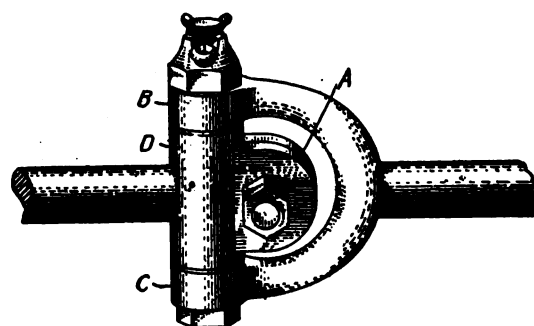


Fig. 4.

worse until the pin is worn entirely in two, or until it breaks under some undue strain which proves too much for the weakened condition of the pin. The actual shape of both the pin and the rod after it has worn badly, is shown by A, Fig. 6, and from this representation the reader will see how the wear proceeds much faster as it increases. That is, after wear has once commenced, and the pin has begun to cut, there is more movement between the parts, and the cutting increases.

It is obvious that the more grit or dirt gets into the hole around the pin, the greater will be the wear of the metal parts, hence it is necessary in pins, not only to keep out lost motion, but to keep out dirt. But luckily when there is no lost motion, there is no chance for dirt, therefore the tight pin has nothing whatever to fear from the dirt question.

Moreover, noise always accompanies loose connections. Who has not heard the rattle and shake of some cars which makes them resemble more than anything else a cross between a naphtha-cleansing works and a boiler factory! Most of the noise emitted by such cars may be traced directly to loose connections, either in pins, bolts, or between portions of the mechanism connected by bolts which should hold the parts rigidly—but which do not!

As soon as the pin begins to wear even the least bit, it loosens up on the washer and this begins to rattle and buzz at every movement of the car. Do you realize how much noise one washer is capable of making when it is working ten hours a day? Well, you would be surprised, and once you have comprehended its noise capacity, rest assured that you will

never tolerate a loose washer in the car you operate or control. If you are ever obliged to run a car with a pin shown, at Figs. 1 and 2, put another hole in the end of the pin and move the cotter to the new hole, then place a coiled spring between the washer and the cotter pin. The coiled spring will take up all the looseness and shake of the washer, it will also keep the pin from shaking endwise, and it will also prevent rattle between the ends of the two rods.

Without the little coiled spring, there are eight chances for looseness and rattle between metal surfaces, at a single pin as shown by Fig. 5. With the spring in place, the chances for rattle are reduced to two—between each rod, and the pin.

A form of construction and design which will eliminate or take care of all wear and rattle, is shown by Figs. 3 and 4. These pins are the same in action and effect as shown by Figs. 1 and 2, nothing having been changed except to eliminate the poor design and faulty construction. Fig. 3, for instance, has the pin made in the form of a stud, threaded into the lower rod, and securely fastened thereto by the nut underneath, which is visible in the engraving. The little helical spring is in evidence to do its part of suppressing noise. All wear and lost motion of the pin in the lower rod has been eliminated by making the pin solid therein. The lug, A, Fig. 3, enables all lost motion due to wear to be taken up in the connection of upper rod with the pin. Hence, there never can be any lost motion or rattle in this connection as long as it is properly taken care of and kept in simple adjustment.

A very good mechanical arrangement is shown by Fig. 4. Here, there is a pin held rigidly at each end, with a castle nut and a cotter pin to prevent the possibility of the pin ever becoming loose through working off of the nut. This obviates the necessity of making a stud, as in Fig. 3, for instead of the stud-pin, there is a plain through-bolt which may be held with a wrench on its head while the castle nut is being adjusted. By using this design, the eyes B, and C, need not be very long as there is no motion of the pin in them as is the case with the other member.

There is absolutely no wear in either B, or C, hence the other member D, may be given great length of bearing on the pin in order to ensure long wear without becoming loose. And when it does become too loose, as will be the eventual result, a little tightening of the bolt through lugs A, will cause all lost motion and its attendant troubles to disappear like magic.

To comprehend the value of the pin connections represented by Figs. 1 and 2, just imagine them as being used for the connection of steering knuckles to an axle. Before the car had run 100 miles, it would be impossible to keep it in the street on account of the looseness of the connections which would permit the wheels to jump and wobble each and every time they struck a rut or a car track. Then consider the connections shown by Fig. 3, for the same wheel attachment. What could be better adapted to that purpose than the arrangement shown? Bear these things in mind when selecting an automobile, and you, Mr. manufacturer, see to it that your engineers are saturated with the principles concerning pins and their bearings, as discussed above.

One more point concerning pins should be threshed out right here and now and that is the tendency of pins to be sheared off by the force they are put in to withstand. In fact, every pin-joint is a virtual bit of wire in a wire-cutter and it will be well to see what resistance pins should be capable of withstanding.

The regulation wire-cutter is shown diagrammatically by Fig. 8. It consists of a pair of half dies or chisels made to fit the wire as closely as possible. The lever L, applies power P, and the short arm of the lever S, determines how many times power P, is increased by the leverage. The wire has a diameter, say of $\frac{1}{4}$ -inch, which we will call A, now, how much pressure (power) must be applied at P, to cut off the wire (pin) A?

Suppose the length L is 18 inches, distance S one inch, and the power P is pounds pressure. What would be the cutting or shearing action upon A? The leverage matter is easily settled. With a ratio of 18 to 1, it is evident that for each pound of pressure exerted upon the end of the lever, 18 pounds will be applied to the pin to shear it off. It is next in order to determine what amount of pressure will be required to shear the $\frac{1}{4}$ -inch wire? It is generally con-

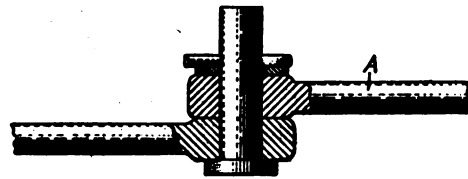


Fig. 5.

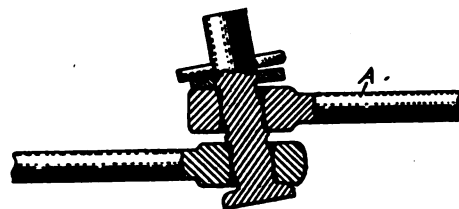


Fig. 6.



Fig. 7.

ceded by engineers that the shearing strength of soft steel is about three-fourths its tensile strength. Hence, with steel having a tensile strength of 60,000 pounds to the square inch, the shearing strength may be taken at 45,000 pounds to the square inch of cross-section.

The area of a wire $\frac{1}{4}$ -inch in diameter is very small indeed. Therefore the wire can endure only that fraction of 45,000 pounds strain. This equals to 2,005 pounds, just about a ton. And to apply that amount of pressure to the wire, it is only necessary to apply 2,005 divided by 18, or 111 pounds, nearly. And this small amount of power applied at the end of the lever will shear the wire or a rivet or pin of the same diameter.

Examine the pin shown by Fig. 5, and see how closely the arrangement of the pin and the rods approaches the wire-cutter arrangement—shown by Fig. 8. They are identical, and the pin will be cut off as surely as it is put under sufficient pressure.

It is evident from the above, that most of the pin failure to which automobile parts are subject arises not only from insufficient wearing surface, but by an insufficient cross-sectional area as well. The writer had this point so forcibly brought up against him at one time that the lesson has never been and never will be forgotten. Although the incident did not apply to automobile work, it is, nevertheless, just as good an illustration. A pump came into the shop to be re-

paired—a plain job-shop where they did everything from fixing a gun-lock to designing and erecting a complete manufacturing plant.

The pump was of the cast-iron type, used for lifting and forcing. It used a short shaft for connecting the outside hand-lever to the inside valve-rod. The handle lever was squared to fit the shaft and had worn so badly at this point that it was impossible to take up the lost motion. Accordingly a new shaft was made, the lever drilled to fit the round shaft and a well-fitting pin driven into the hole.

The device worked first rate while starting the pump, and perfectly until the water had been raised to the lower bucket, then—the pin sheared right off! Other pins were fitted but each and all went the same way. A tool-steel pin was inserted and it stood the strain two days, then it snapped short off. The writer cured the trouble by inserting a new pin, then drilled another hole parallel with the shaft, half in the lever casting and half in the shaft. A $\frac{1}{4}$ -inch pin well fitted into this axial hole, stood the racket. It acted as a key, and opposed sufficient cross-section to withstand the pressure which came upon it.

Not only should all pins be designed for automobile work to carry the breaking load to which they are likely to be subjected, but they should also be made

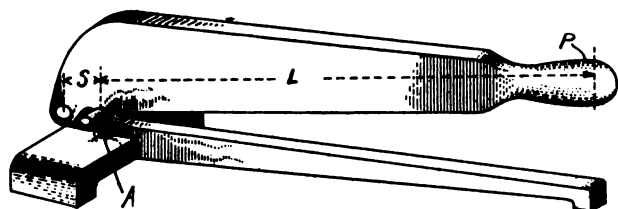


Fig. 8.

with an excess of strength, commonly known as a "factor of safety." The excess of strength in pins should be several times the actual load as calculated. For instance if a man hits a lever with a hammer, when something sticks, he is exerting upon that lever a force far in excess of what the designer considered a safe load, and that which he provided for.

This point is clearly shown in the wire-cutter, Fig. 8. It has been shown that a pressure of about 111 pounds on the far end of the lever will exert a pressure of more than 2,000 pounds on the pin. Suppose a piece of hardened steel was placed at A by one of the dampfools who are always doing such things. Then it will be found that much more than 111 pounds is required at P, and that a good deal more than a ton of force is necessary at A to cut the hard steel. From inspection of the engraving, it is evident that pin S, must carry exactly as much strain as does the wire to be cut at A, therefore, were both A, and S made of the same material and diameter, it would be an even wager which would cut off first.

But as the cutting is in all cases required at A, the designer made pin S the larger so as to withstand more pressure than can be carried by pin A. This is as it should be, but did the designer of this tool take into consideration the possibility of the d. p. man putting a hardened steel pin at A, and then hitting the lever with a sledge hammer at P, to cut off the hardened pin at A? Such things as this is what the "factor of safety" is for, and in tools of this kind, it should not be less than 10. Hence, pin S, should be made good for 20,000 pounds, instead of 2,000 as noted elsewhere.

To give this strength, provided the pin is made of

the same soft material as the wire to be cut, the area of the pin should be ten times the area. This means that the pin at S, should have a diameter of about eight-tenths of an inch. Please study these matters carefully, my automobile friends, act accordingly and stop all pin wear and its attendant breakage and rattle of loose parts!

Reflections of Sam.

From O. H. Hampton, Indiana.—A few evenings ago Sam came strolling up the walk to where I sat on the veranda. I told him the big porch rocker had been waiting for him, and as he sat down, intimating he could have a good cigar if he had anything as good as his Hoodoo Story was. "I'm afraid I can't earn the cigar this time" said he, "but perhaps I can give you a few odds and ends." "Let's have 'em," said I, and Sam began.

"Did you ever notice," he said, "that it is a pretty good thing to have your wife along when something happens to the machine?" "Well, you know that old car of mine has a chronic habit of going bad, and when it does and my wife is along she can and does do the fretful fractiousness that a man feels like doing on such occasions. Some time ago she wanted to go to her sister's wedding anniversary party over to New Castle and had me to take her, or rather start with her in the machine. About two miles out from home the uncertain old car went bad and as we had got a rather late start, she sat in the car and said things while I tried to fix it. She also employed her time in asking questions as to what was the matter, and wanted to know why I didn't fix it before it went bad, and why I didn't buy a machine in the first place that would stay fixed instead of buying this old junk pile that never was any good when it was new, let alone after it had been thumped to pieces by the Wagner boys it was bought from, and indulged in various other remarks and questions of a similar nature.

"Meanwhile, I was on my back under the machine and kept still until forbearance ceased to be a virtue and then I indulged in a few ejaculations which seemed to me to be suitable to the occasion. Then she said she would go to that house over yonder and 'phone our hired man to bring old Dick and the buggy for she must get there before the next wedding anniversary rolled round. The hired man appeared in due time with the horse and buggy and I was left to myself, but I didn't care much for the trouble.

"My wife had got about two miles when I overtook her and passed her with the machine going at its best licks. I yelled to her that I would tell the folks that she would be along in about two hours. Now this is not much of a story, but there is a mighty good moral to it: Don't marry an automobile girl on a wheelbarrow income. Mary loses a portion of her respect for me every time the old machine goes bad."

"Last Sunday evening just at dusk a friend, ——— drove through town at furious rate, no muffler on the machine, valves rattling, loose bearings pounding, four dogs in full chase and three policemen giving him the high sign, yet he looked neither to right nor left, but straight ahead and disappeared at the other end of town as suddenly as he entered. I tried to stop him and came near getting run over. Next morning I asked him why he didn't stop when I hailed him. He said he had been cranking that motor for three weeks and never got it to start till last evening and when it did start he determined that he would put it to it's best licks and not stop for hell nor high water

so long as the motor would run. He said if the motor had kept going he would have been in Michigan before sunrise. I asked him how far he got and he said, "oh about a mile the other side of town."

The Question of Rust.

There is an important point to remember in connection with the use of paint for the prevention of rust—the metallic surface should be perfectly clean chemically. It is absolutely futile to paint over an already rusted surface; in the first place the paint will not "bite," and in the second place the rusting will still continue. Possibly the chassis which resisted rust better than any were those with tubular frames, which were japanned, thus completely protecting the metal in a way quite impossible with paint. When one considers the danger arising from the weakening of the metal by this corrosive process of rusting and also the vibration, one will appreciate the importance of such parts as steering and brake connections receiving the most special attention. It is customary, for instance, to keep a liberal supply of grease about the steering knuckles, and it is important that the grease should be the purest obtainable.

An excellent object lesson for the motorist is to examine a chassis the body of which has not been taken off for, say, eighteen months or two years. The amount of rusting which has gone on is remarkable, and plainly proves the necessity of frequent examination. The owner-driver of the runabout type of car painted in grey has a distinct advantage over the motorist possessing the more lordly painted and varnished open or closed touring car, for as a rule the light body of the runabout can be easily detached, the rust removed, and the affected parts painted grey without detracting from the "smart" appearance of the car as a whole.

In the removal of rust, say, from the rim of a wheel it is customary to use some substance to soften the deposit—kerosene, for example, which contains no oxygen—and if necessary the very finest of emery paper, then a dressing with alcohol or methylated spirit (to ensure thorough cleaning), and finally a coat of paint.

Electric Vulcanizers.

From C. A. Shaler Co., Wisconsin.—In your March issue there appeared the following questions from "a brother of Connecticut" as follows: "I presume many of the readers have used vulcanizers. I see all kinds advertised—electric and steam and heat. (Supposedly electric and steam heat was meant.) I would like to ask through your paper which is the quickest and best." And in the April issue appeared a reply from A. C. Doane, of Illinois, in which he tells of his experience with a portable, steam vulcanizer and in which the following appears: "I would say that it looks reasonable that the steam vulcanizer would be the better one to use, as the heat being a moist heat instead of a dry heat, should be better for the rubber."

It is due your readers that this supposition should be fully explained and corrected and as students of vulcanizing for over eight years, we take the liberty of making this explanation. The supposition that the only safe method of vulcanization possible is by steam and that all steam vulcanizers are reliable is prevalent in the minds of a number of laymen and even in the minds of some having considerable experience in tire repairing. It arose from the fact that as rubber vul-

canizes between 250 and 275 degrees Fahr. only, a practical vulcanizer must have an exact temperature control and for a great many years the only successful method for temperature maintenance on a vulcanizer was that on the large steam vulcanizers, the safety valve. No method was discovered for a number of years for absolutely controlling any other than steam heat, but with the invention of the electric vulcanizer by Mr. Shaler, a process was brought out in which is not only the heat absolutely under perfect and automatic control, but a method which is the simplest possible and, as stated above, the only reason why steam heat is of any value for vulcanization, is because it is easily regulated. Some people have attributed the reliability of steam vulcanizers to the supposed fact that steam exerted a chemical influence upon the rubber, but as a matter of fact, in the vulcanizer referred to in Mr. Doane's reply, the steam does not come in contact with the rubber at all and in the large kettle vulcanizers, in which vulcanization takes place in live steam, the utmost care has to be used to protect the canvas of the tire, for should it be reached by the steam it will not adhere to the rubber.

Furthermore, on practically all portable steam vulcanizers, the only way of controlling the temperature is by hand in some such way as opening and shutting a draft, or turning up and turning down the flame which supplies the heat and this is the very reason, as Mr. Doane states, that sometimes he found that the rubber was cured too hard, in which case it cracked and did not last, while on the other hand at times the temperature would not be high enough and the rubber would be undercured and too soft. This is impossible on any electric vulcanizer on which the temperature is automatically regulated, as is the case with the Shaler Type D for auto owners and Types C and E for garages on which the current is automatically turned on and cut off through the making and breaking of the circuit by the expansion and contraction of a thermostat spring at certain temperature which the vulcanizer receives.

On the Shaler alcohol heated vulcanizer, the Stitch-In-Time, the thermostat regulates the temperature by automatically opening and closing a damper.

Demonstration Abuses.

Attention has recently been called to an old abuse in the sales end of the automobile business which is again cropping up; that is the "demonstration abuse." A number of dealers have lately been importuned for demonstrations running from 50 to 150 miles. While the dealers do not object to giving a reasonable demonstration, they do not feel that they should be compelled to give a demonstration of 150 miles, without some assurance that they will be reimbursed for the expenses of the trip. It is believed that a short run and up a demonstration hill will show the power and quietness of the motor and the easy riding qualities of the car, as well as a long demonstration will.

In order to do away with this abuse, a number of dealers make it a rule that upon the proposed customer demanding a long demonstration he be requested to deposit with the dealer, a sufficient amount to cover the expenses of the trip. In event of the purchase this amount to be deducted from the purchase price and if the prospect does not want the machine he is to forfeit the amount of money deposited. This will mean that these long demonstrations will only be given to bona fide purchasers and the "joy-rider" will be eliminated.

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NEW YORK, JUNE, 1911.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

THANKS.

We want to thank most heartily all of our friends who have taken the trouble to send us the names of parties owning automobiles with whom they are acquainted.

It is our ambition to increase our subscription list very materially during the Summer, and our readers can help us do this, by sending the names of their friends, who are not already subscribers.

THE BEST PREVENTIVE.

A judge of one of the New York City courts recently characterized "joy riding," or taking an automobile for use without permission, as thieving, and coupled with it a sentence of two years' imprisonment for the culprit.

A few examples of this sort, making the punishment fit the crime, and giving it wide publicity, will pretty nearly put an end to "joy riding" practice. Both the term and the crime itself, were conceived in a commingling of moral turpitude and ignorance. Severe punishment is the only preventive.

LOCK YOUR CARS.

A young man in this city recently seeing an automobile standing in front of a hotel, proceeded to appropriate it for his own purposes and in due time came to grief by running the car into a telegraph pole. The car was wrecked but unfortunately the thief escaped injury. It may be repeated that with numerous practical devices on the market for locking cars not much sympathy need be wasted on the man who leaves his car standing in the street of this city or any other. Physicians especially need a locking device on their cars as they are constantly leaving them to visit patients.

A GOOD PROPHECY.

"The chariots shall rage in the streets, they shall jostle one against another in the broad ways; they shall seem like torches, they shall run like the lightnings."—Nahum ii:4.

Nahum the Elkoshite was a good prophet. No one to-day could depict more accurately or picturesquely conditions as they exist in the streets of our larger cities. Automobiles do rage, they do "jostle" one against another, they do "run like the lightnings." In order to feel fairly secure and safe, the man who drives a car in cities must be Argus-eyed and Janus-faced. Little wonder that the poor pedestrian often gets a bit bewildered when he attempts to take the cross walk.

We might quote Nahum further and say that he was also about right when he said that "none shall look back." To look back when driving a car in the city is reckless.

By the way, the Bible is not being read as much as it used to be nor as much as it should be. Whether it be the "word of God" or not does not matter. Let the skeptic sneer at its miracles, the doubter challenge some of its teachings, the scoffer point to the "mistakes of Moses," or others ridicule its stories of by-gone days. It is by far the most wonderful book ever printed, and was prepared or translated with an effort for truth and accuracy that no book has ever since received.

It may be remarked in passing that it was first divided into six parts, and each part assigned for translation to a commission of scholars selected for their learning without regard to creed. Then the group met together and comparing their translations with all others, decided on the version which we have to-day. Every subsequent record, graven on stone or pressed in clay, furnishes additional proof of the verity of its statements. If it be treated as a purely human document, it still has a value possessed by no other book.

Of course Nahum had Nineveh in mind and not automobiles when he made his prophecy. But that is neither here nor there. Let some writer of to-day give in as few words a more accurate picture of conditions in our streets if he can.

IS THIS THE RIGHT POLICY?

It must not be assumed that the views of our contributors are always correct, and even if they were it is unlikely that they would be received with general approval. But in either case it is felt that they will assist in leading to the truth and correct knowledge, although difference rather than unity of opinion is the shortest and surest route to that end. And as we owe most all our knowledge to difference of opinion, it is indeed singular that there should be any irritation when some one does not believe as we do.

The automobile is practically in its infancy, and naturally no special mechanical principles or the accessories more or less in use have yet been settled upon as most desirable. Nor would it be possible for any one individual to so thoroughly test or try out all designs and substances, and all the various accessories, so that the best could be known beyond question. Even if this were attempted, personal feeling and taste would somewhat influence judgment. Why, just at this time members of even the great Supreme Court of the United States are publishing their honest differences of opinion concerning certain matters about which the public seems also to be of

widely divergent opinion. But these discordances of the wise are something like the war of the elements, they ultimately clear the air and establish harmony and truth.

So when we publish the opinions and experiences which our readers and contributors are good enough to send us, we do not expect them always to be correct to the exclusion of all others, but that they are honest, unprejudiced, and will help to arrive at the truth. This is the way everything in the world is settled about which there is any question or uncertainty.

As this magazine is something of a forum for the discussion of all that pertains to the automobile, the freshman, the junior and the senior—those who seek knowledge and those who impart it—are welcome, thrice welcome, to take part in it. We cannot very well cut off reasonable debate, even were we so disposed. This is not done in our halls of legislation, much less in the case of something more accurate of comparison, the old "town meeting" where all are allowed to say something. And who can imagine a real court of justice where the judge refuses to hear testimony?

It is admitted that this magazine is different from others. We want it to be. Were it not, it would be of no more value than others. But the constant aim is to make it instructive and readable, to not allow it to "get in a rut," to move in the domain of thought, and to keep near enough in the forefront to hear the sweet music of progress.

To the many who send in communications based upon their own honest opinion and observations, we are deeply grateful. Were it not for their friendly loyalty thus and otherwise expressed, The Automobile Dealer and Repairer would be of far less value to its readers. For the knowledge of the editor is like the rivulet, his ignorance like the mighty sea. He does not know all about any one car, much less about all cars. But he ventures to remark that no interest warps him, no prejudice blinds him, no fear intimidates him, and no lack of effort retards him.

A ROTARY ENGINE.

The internal combustion engine gave us the practical automobile. Self-propelled vehicles were invented as far back as 1680, but it was not until somewhere along 1827 that they were operated with a fair degree of success in England. Possibly they might have been further developed and improved at that time had it not been for hostile legislation occasioned by coach builders, who were afraid they might ruin their business.

But wonderful as has been the progress of the use of the automobile in the past ten years, it is insignificant compared with what it will be if the practical rotary engine is at last an established fact.

On another page of this issue will be found an account of a new rotary engine which has been invented by a Buffalo man. The first hand statements are given for what they are worth, and if they are no more than the truth and are the whole truth they are of decided importance. A representative of this magazine has seen one of these engines running in Buffalo, and he says it was almost noiseless and devoid of vibration. The most doubtful feature of the invention is that the company exploiting it seems to be engaged rather more in selling stock than in making engines. But this has been the history of most great inventions. Stock in the Bell Telephone Com-

pany was being sold long before many telephones were installed, and this was done in developing the wireless telephone.

Let this be as it may, however, this rotary engine has been running in Buffalo for some time and not only is it highly endorsed by the concern that has it in use, but a good many mechanical engineers of good repute have publicly expressed their approval of it.

The point we wish to make is that if this rotary engine is all that has been stated by those interested, then good-bye all other kinds of motive power for automobiles. And its use will be as long a step in advance in developing self-propelled vehicles and flying machines as was the first use of the ordinary internal reciprocating engine.

VEHICLE ACCIDENTS.

There are always people who dislike anything they do not happen to possess. In the case of the automobile, many dislike it because they know nothing about it, and they know nothing about it because they dislike it.

It is scarcely necessary to state that the automobile is the safest vehicle ever used by a human being, and so much safer than the horse that the two are not in the same class. It can be handled by a child, and it goes exactly where and how it is guided.

Moreover, it appears from figures published by the National Highway Protective Society that of the 51 fatal accidents due to vehicles of all kinds in New York City for the month of May, but 7 were caused by automobiles. The agent of this society reports a steady decrease of automobile accidents and an increase of accidents by wagons and trucks.

The fact is, if automobiles were controlled or driven by careful reasoning human beings, there would seldom be an accident with one. As we have stated again and again, most accidents are the result of reckless haste. It is often stated in the press that a certain accident was due to no fault of the driver, because "his car was being driven very slow, at the time the accident occurred." There has never been an automobile accident, no matter how slow the car was being driven, unless it could have either been avoided altogether if it had been driven still slower, or the consequences very much mitigated.

In a large percentage of accidents where other vehicles or pedestrians are concerned they are either partly or largely to blame, but as this magazine concerns automobiles alone and does not reach the general public it is not exactly our province to caution or admonish them. It may simply be stated that they are often exasperating beyond measure.

AIR CAPACITY OF TIRES.

Very few car drivers or owners take into account, as they should, the air capacity of their tires or fully estimate its relative importance. In this connection, the mechanical engineer of the Goodrich Tire and Rubber Company says:

"The fact that the plentiful and inexpensive air contained in a tire regulates its carrying capacity is best of reasons for measuring the tire's air holding capacity. The outer casing and inner tube perform absolutely no function except to contain or imprison the air, which cushions the shocks of uneven road surfaces. The air's wonderful flexibility is what has made it so difficult for inventors to find a substitute.

"All kinds of rubber and metal devices have been

patented and apparently perfected, yet none approaches air in resiliency.

"Therefore the more air you ride on the greater the cushion, the less the severity of the bumps, and the greater the life of the tire.

"It has been proven that a car used under similar conditions of speed, weight and roads, will run from two to three times farther on 33x4 inch tires than if equipped with 32x3½ inch, both fitting the same rim. This is especially true when tires are overloaded. It follows, then, that the air capacity of a tire determines its carrying capacity, which is its life."

The foregoing is important and true. It must not be forgotten, however, that the larger the tire, other things being equal, the slightly greater the necessary propulsive power and the greater cost of the tire. There is another feature that may here be mentioned. Large tires are harder on the steering connections than small. And finally, in the matter of tires, like most other questions of degree, extremes are dangerous. Too heavy tires on small cars are not advisable. There is a desirable mean weight, a desirable mean size, and a desirable mean inflation.

It cannot be stated too forcefully that from 50 to 75 per cent. of tire destruction is due to under-inflation. Yet even so, there is danger to comfort if not to the liability of blow-outs in too much inflation. The inflation pressure should be uniform and as given by the manufacturer, and should vary only according to the load of the car.

WIND PRESSURE.

If the present average and special high speeds of the automobile are to continue, the next advance in construction should be to avoid the present wind and air pressure. In some cases this is being already taken into account, but not to the extent that it should be. Changes in bonnet and wind shield construction will have some effect, and quite likely other modifications in the direction of general style may be made to reduce wind pressure.

The pressure of a strong wind in the case of a car going 30 miles an hour has a far more retarding influence than may be generally imagined.

AUTOMOBILE RACING.

The 500 mile international automobile race at Indianapolis furnished no useful lesson to either manufacturers or owners. The unexpected did not happen. It was pretty certain that the race would be marked by death and general destruction, and this helped to swell the attendance to the enormous number of 80,000.

A rather close analysis of the winning cars and their construction and accessories proves nothing. About all that can be assumed is that the successful drivers might be the better and that they had the better luck.

But as a popular outdoor sport automobile racing may be put down as second only to base ball, while if one delights to see a fellow mortal killed or maimed, there has been nothing so exciting since the days of Nero, although bull fighting is a close second.

THOMAS A. EDISON.

Thomas A. Edison is reported to have said that he has perfected a storage battery that is light enough to carry in a dress-suit case and can be renewed in three or four minutes for a service of from 50 to 75 miles. Possibly this good news requires a slight discount, for like all optimists, and mechanical pioneers, Edison

does not sometimes succeed in keeping his hopes and imagination within absolute bounds, but even allowing for this, the information is extremely important in its relation to transportation in cities.

Measured by service rendered and reward exacted—and this is the correct way to estimate usefulness and public service—this country owes more to Thomas A. Edison than to any one living. No honors or successes are too good for him.

THE CAR AND THE LAW.

Injury by Collision.—In an action against a railway company the evidence showed that the plaintiff was riding on a city street in an automobile owned and driven by her husband. She and two friends were on the rear seat. Another sat with her husband in front. As they approached a crossing an engine pushing some freight cars was moving on the railroad track toward the street. A switchman came around the end of the nearest car and called to them to stop. They did so, close to the track. At that time the engine and cars had stopped, the nearest car being about the middle of the street. The switchman then called for the vehicle to proceed, and when it was on the track there was a collision with the cars, which again moved up. The plaintiff jumped or was thrown out and was injured. It was insisted for the defendant that the accounts of the plaintiff witnesses were improbable and incredible. The court held that this was not so. Statements of distance and speed of moving objects by persons inexperienced in judging of such matters are not always to be taken as exact. If a number of average persons affected with the excitement of a collision should afterward agree precisely upon such details it would at least suggest rehearsal. The plaintiff, who sat at the end of the rear seat farthest from the cars, testified that she was preparing to jump, and that when the collision occurred she was thrown out quite a distance. It was argued that this was contrary to well known natural laws, because the impact would have caused her to fall backward into the vehicle. That, it was held, does not follow, for if, in preparing to jump, her body was inclined in the direction of the applied force, she might have been thrown forward and out.

Right to Use Street Railway Tracks.—In an action against a street railway company for injuries to the plaintiff and his automobile from collision with a street car, the defendant requested the court to charge that if the automobile was being operated upon the track at a time when it was unnecessary to do so, and when a car coming in the opposite direction might be expected at any moment, and that fact contributed to the injury, without which it would not have happened, and was apparent to the plaintiff, the latter was guilty of contributory negligence and could not recover. It was held that this instruction was properly refused, as that would mean that nothing but necessity would justify the use of that part of a street covered by street car tracks while the line was being operated. A traveler on a public street may lawfully use any part of it he pleases when it is not in the immediate use of another, even though there is no other requirement for him to do so than that of convenience.

Garage Not a Nuisance.—The owner of a lot and premises in a city, leased to a tenant as a dwelling house, sought to enjoin the construction of a garage about 70 feet from the dwelling house as a nuisance. It was held that he had no cause of action for the reason that the objectionable features which he an-

ticipated were chiefly noise and bad odors, which, if they ever came, could only offend the occupant of the premises holding under the lease. Plaintiff was only a reversioner, and had no present right to complain. In any event, the injury was only problematical, and the action was prematurely brought. The business of conducting a public automobile garage is not a nuisance of itself, but is a legitimate and necessary industry. The garage may be so ventilated that noxious gases and odors may pass off and not be offensive, and proper rules may be promulgated and enforced whereby the noises incident to a garage, the testing of engines, the blowing of horns and other noises, may be reduced to a minimum. It appeared from the evidence that much of the noise from the automobile can be avoided, and is due to a great extent to green and inexperienced drivers and crude machinery of the earlier type of cars.

Trying to Make Law Breakers.

John S. Sutphen, writing to the Journal of the Automobile Club of America, tells of a little trick worth while warning motorists about. His letter is:

"Last Saturday I was returning from a day's trip in the mountains of Pike county, Pennsylvania. We encountered a rough road from Suffern, N. Y., till we reached Ramsay, N. J. There the road became better and ahead of us (my son was driving the car at the time) we saw two men standing in the road by the side of their motor-cycles. One was dressed in a khaki suit and the other in a dark brown suit.

"Upon hearing our horn they started their machines and jumping on rode off ahead of us hitting up the pace till they were soon travelling at about thirty miles an hour. I restrained my son from opening up the gas, for I instantly surmised what the men were. These two men tried in every way to coax us on. They would drop back until we would nearly catch up with them, then they would turn around and look at us and spurt for half a mile and disappear in a cloud of dust, first one in the lead and then the other. We jogged along at an even pace, however, and did not fall for their trap. They kept this up from Ramsay until nearly Arcola on the Paramus road.

"The point I make is that was a contemptible trick to attempt to entice an automobilist to break the law. If a man is speeding it is one thing, but to try deliberately to coax him on is, I should think, illegal action. Furthermore, what right had these men to go tearing over the roads at the rate they did? I mention this as I thought it might prevent some member from getting into trouble."

A party of motorists coming up from Garden City the other day had a somewhat similar experience with a single motor-cyclist, who mounted at the Nassau county building down there and passed by the car at a good rate of speed. Then he loitered ahead, looking back constantly, and gave every appearance of wanting to make a brush of it. Although the man was in plain clothes, the driver of the car knew him for a policeman, and kept on about his business.

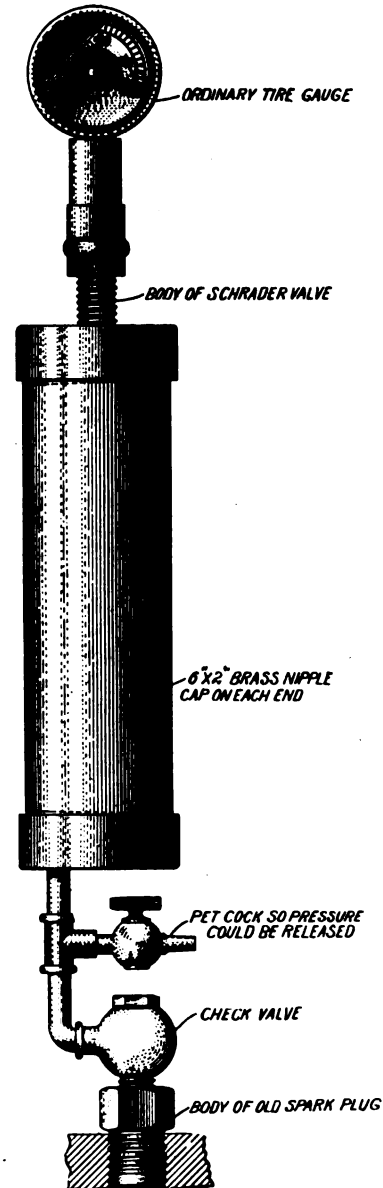
Nothing approaches air in resiliency. Therefore, the more air you ride on the greater the cushion, the less the severity of the bumps and the greater the life of the tire.

Use the throttle when slowing up for bumps and corners rather than depending upon the clutch and brake and allowing the motor to race meanwhile.

A Problem in Compression.

From Betsey Bobbett, New York.—I feel like the man at a big dinner who was served with something he did not recognize and feared to eat. On inquiry from his neighbor on his left, he was whisperingly told, "lobster à la Newburg." Although excepting the word lobster, he did not feel much enlightened, nevertheless, when his right hand neighbor asked him what this was, he was fairly bursting with information.

That is my case. I am fairly bursting with information. It isn't "lobster à la Newburg," this time, but it



is "adiabatic" compression, as it is but very recently that this word has been added to my vocabulary. It happened this way: Not at a dinner, but at a gathering of automobile enthusiasts after a club meeting, a theory was advanced that very slight leaks in multicylinder engines would cause sufficient difference in the compression pressure to cause uneven running of the engine. It hardly seemed possible to me that at the speeds at which automobile engines run, probably never less than 200 revolutions per minute, small leaks could cause any appreciable difference in the compression pressure, and this started me on an investigation of my own six-cylinder car.

First I borrowed a compressometer and tried each cylinder separately to find that if cranked slowly, they differed very much, running from just above 40 pounds to just under 50. By cranking as rapidly as I could, these pressures could be raised to about 56 pounds and became more nearly like.

Next, I ran the engine on five cylinders while trying the sixth. From each and every cylinder I obtained the same result, viz.: 67 pounds, but the hand on the gauge jumped so much that I concluded this not to be fair or correct and was probably too high, owing to the momentum of the working parts of the gauge. I had also discovered when cranking by hand that a full open throttle was conducive of higher pressures. This of course was natural enough, but I think too much of my car to open the throttle wide with no load, so my attempt to run on five cylinders while trying the sixth was condemned as valueless.

My next step was to take a hint from some article I had read in a trade paper, and I constructed a piece of apparatus like the sketch. I put the check valve as **low down as possible**, so as not add to the compression space, and believed I had a piece of apparatus that would allow me to pump up my compression and hold it. With the throttle wide open I could readily **get 57 pounds** pressure in the air chamber and could hold it, and every cylinder showed precisely the same result. I knew the makers of my car claimed 80 pounds compression, and I also knew that my car seemed as fast and powerful on the hills as ever, so this whole matter sort of got on my nerves and I could think of nothing else.

My next move was to measure my compression space. Putting a cylinder on top center and taking a quart of oil, I filled the space and carefully figured how much oil I had left, and even figured the quart measure as a check. Two cylinders were tried, and the result was 22 cubic inches in one and 23 in the other. My piston displacement I figured to be 67.38 cubic inches. Feeling that I had something solid to stand on, I added these two and had a little over 90 cubic inches compressed into 23 cubic inches. This is a compression, I believe, of 3.9 atmospheres, and an atmosphere is approximately 14.7 pounds per square inch. Here I was back to about 57 pounds per square inch as shown by crude apparatus. I was simply in despair, and wrote to two of the trade papers seeking information and putting up a hypothetical question, giving 60 cubic inches piston displacement and 20 cubic inches compression space, that is, four to one, and asking what the compression would be. The answers I received were not very satisfactory from my point of view, so I decided to write the makers of my car. They gave me 67.38 cubic inches of piston displacement and 23.95 cubic inches of compression space. My 23 inches were not far out. They totaled this at 91.33 and figured the compression space at 26 per cent. of the total. They then referred me to Kent's Engineers' Pocket-Book which says that the "adiabatic compression" of air into a space 26 per cent. of the total volume results in 80 pounds pressure per square inch.

Now I have passed my newly acquired information on to a number of neighbors and await their comments. Perhaps Mr. C. J. Pembroke can throw some light on this subject and again confer a favor on "Betsey Bobbett."

I may remark as a sort of a postscript, that "adiabatic," as nearly as I can get at it, means compression without the loss of any of the heat generated by such compression.

BATTERIES AND COILS.

Vibrator Adjustments and a Comparison with the Magneto Ignition System.

From E. H. Van Patten, M. D., Washington.—A question asked by Mr. Edward Lundgren suggests a matter connected with batteries and coils in connection with automobiles that is too often overlooked by users. I mean the adjustment of the vibrators on the coils. I know of one man who last year used up a set of six fresh battery cells every week, merely by a wrong adjustment of the coils. It does no good to screw down the adjusting screw beyond a certain point, so far as the ignition is concerned, because it can only cause the tension on the vibrator spring to become stronger, and therefore consume more current before the contact is broken. The vibrator ought to be adjusted so that when at rest and free from the adjusting screw, its free end is not over one-sixteenth of an inch from the core of the coil, and **less than this even is often better**. Then when the adjusting screw is tightened up so as to make contact with the vibrator it takes but very little tension to cause it to buzz.

The best way to adjust the vibrator tension is to use an ampere meter across the coil and observe how much current is being consumed. Some coils require more than others, but my coils (Pittsfield) require about three-fourths of an ampere on short circuit, and when in use take only about four-tenths ampere. This saves the strength of the batteries, besides being easier on the coil and giving as good a spark as can be gotten by any tighter adjustment. I use on my car a Hoyt voltammeter on the dash, with the volt-meter across the battery and the ammeter permanently across the coils. This at once shows me how the connections are in my battery and what strength of current I have behind my **sparkling system**. It also warns me when my batteries are about run down. The ampere meter also, when the engine is running, tells how much current is being consumed, and indicates whether there is a short circuit in the secondary current.

If a terminal came loose from a spark plug and touched any part of the engine I would be notified of it, not only by the missed explosions in that cylinder, but by a violent reaction in the ampere meter. The needle would oscillate clear across the face of the instrument every time a spark should have passed at the particular spark plug which had been placed out of commission. This acts as a steam gauge does on a boiler; it gives a constant knowledge of just how the parts of the ignition system are working, and if they are at fault it suggests just where to look for the trouble. If more attention were given to this matter there would not be the great cry for the expensive magneto.

Another thing in this connection, is the fact that it is only at high speed that the magneto usually gives its hottest spark, and the stunt which is usually worked to prove that the magneto always gives a hotter spark, is really a deceptive thing. A driver will notice that, with the spark lever in the same position, when the switch is moved from the battery side to the magneto on starting, the engine appears to speed up slightly. This is usually interpreted to mean that the spark from the magneto is hotter than that from the battery and coils. But a little thinking will convince any one that this is erroneous. First, it is a well recognized fact that with coils there is a certain

lag in time, or apparent slowness in the current building up the coils, before the secondary spark appears. While this appears to be very short to the eye, and in fact, we cannot appreciate it by the senses, yet it is true and is easily proven. This lag exists also in the magneto, although it is considerably less. Now what really happens when we switch from the battery side to that of the magneto is, that the lag being less, we really have advanced the time of ignition by just the difference in the time lag of the two systems. Hence the demonstrator utilizes this peculiarity to magnify the supposedly hotter spark of the magneto.

A good coil with a good battery suited to it will give a hot spark fully one-half inch long with the secondary terminal free from the spark plug and brought near any metal portion of the engine. I have never seen any magneto which will give so large a spark as this on turning the engine over, but with my coils that is what I get for starting.

It is also on account of the difference in magnetic lag between the two systems which makes it necessary for the spark lever to be advanced more for a battery and coils system than for the magneto. But that does not prove that the magneto ordinarily gives a hotter spark than can be gotten from the battery and coils. In fact I am convinced that, with light runabouts, the latter is more economical than is the magneto, and also that with the meters on the dash to enable you to judge of all parts of your ignition system at a glance, more than one-half of the ignition troubles may be ended.

Pardon me for writing at such extent, but this is a subject which is intensely interesting, especially just when the whole tendency is toward the use of the magneto, and its merits are being vaunted to the limit.

Also, I should like to suggest that an expert in the use of the coil system can get more power out of an engine fitted with proper coils and their accessories than will be gotten from the average magneto fitted with a fixed spark, just because the advance of the magneto spark cannot be permanently fixed so far ahead as to get anything more than good average running ability, and also because the proper spark advance is a matter of speed and varies with the load.

Select a Quiet Color.

In selecting the color of a car or having it repainted, it is prudent to select a quiet color, which does not show every scratch and mark in an exaggerated manner. All light shades should be avoided, especially cream, primrose, and salmon. A dark olive green both looks smart and may be relied on to resist a shabby appearance as well as any other color, and better than most. Khaki and French grey of various shades are colors which wear well, but to many tastes there is a shabby, unfinished look about most cars painted in this way, which detracts from their smart appearance as a rule.

Do not allow the repair men to interfere with the adjustment of the carburetor until the last resort, as the manufacturer has undoubtedly had the carburetor adjusted by an expert and well tested before the car was delivered.

Always see that the spare parts carried on the car, especially the valves, are of the proper size for the engine, so that there may be no annoying delay if they should be suddenly called into requisition.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

The list of accidents given this month is both short and not of a specially instructive character. The number of accidents reported is quite as long as usual, but they are mostly of the more common form—collisions at grade railway crossings and accidents due to the utter carelessness of children.

According to a recent decision of the Supreme Court of Massachusetts, there is no absolute or fixed speed limit at which automobiles may be operated in that State. The court decided that if a jury finds that the rate of speed was reasonable or proper, having regard to traffic, use of the highway and safety of the public, it should find for the defendant, no matter at what rate of speed he operates his machine. This of course is the only rational conclusion. Automobiles may often be driven much faster than the speed allowed in States where limits are fixed and yet with absolutely no danger to any one or thing; and again, a car may be driven much slower than the legal rate of speed and yet such speed would not be reasonable and proper. Massachusetts is always in the vanguard of legal progress, and it has set an example in this case which all other States and countries will finally follow.

A Terrific Collision.—One death and seven serious injuries were the results of a touring car and a truck coming in collision in Chicago. The police are inclined to blame the occupants of the automobile, although about the only evidence found against them was two flasks of whiskey beneath the wreckage.

Impaled on a Wagon Pole.—In Baltimore, Maryland, a machine struck a lumber vehicle and became so thoroughly impaled on a pole standing out beyond the vehicle, that the pole had to be sawed off before the car could be released. The wreckage was enough to fill the street, but no one was seriously injured.

Result of a Skidding Car.—A touring car skidded on the street in Brooklyn and struck another car which resulted in flying glass and two very badly damaged cars. Most of the passengers were women. Although they were badly shaken up, they were able to be taken to their homes without the attention of a physician.

An Unguarded Railroad Crossing.—At Shelby, Ohio, three men were killed and one fatally injured when a passenger train struck an automobile at a crossing. The four occupants of the car were joking and laughing as their machine neared the railroad which was unguarded. The train was behind time and running at the rate of nearly a mile a minute. It hurled the automobile 40 feet and threw its occupants 100 feet or more. Accidents at railway crossings do not diminish. The only sure preventive is to always stop and look each way before crossing.

The Car Turned Turtle.—In St. Louis one man was killed, six persons injured, several had narrow escapes and two automobiles and one motor cycle were wrecked in one day. The worst of these several accidents were caused by the steering gear giving away. The driver lost control of the car and it turned halfway around; it then went over an embankment nine feet high. It fell on two men and crushed their lives out.

The Brakes Did Not Work.—At Kearney, Nebraska, a woman is dead and her daughter danger-

ously ill with her leg broken in two places, and three other persons very seriously injured, because the brakes of the car they were occupying refused to work. The car had nearly reached the summit of a hill when it stopped owing to a lack of power, it then shot backward down the hill into a ditch with the result as stated.

Found Dying in a Ditch.—A man in Syracuse, N. Y., had been demonstrating a car to a prospective customer, and in some way it crashed into a tree. He was so badly injured that he died three hours later. Although the full facts are not known, it is thought a broken spring was the cause of the accident, as the driver had been warned not to take the car out until it had been repaired.

Result of a Tire Blow-Up.—Near Plainfield, N. J., a party started out for a trip, but when crossing a bridge, the tire of one of the front wheels blew out causing the automobile to swerve suddenly to one side and collide with a bridge post. The automobile was badly damaged and one of the victims most seriously injured.

Struck a Bed of Sand.—A party of friends, among them a clergyman's wife, was riding on Long Island when the car struck a bed of sand, and turning over, pinned all of its occupants under it except one. She hastened to a nearby residence and got assistance when the car was righted and the occupants released. The clergyman's wife was killed and the others were obliged to go to a hospital.

A Tire Rim Flew Off.—Two men, strangers to each other, were hurrying down Fifth Avenue, New York, when there was an explosion like the report of a gun. The tire to the wheel of an automobile came off and rolled down the street where it entangled itself in the legs of a cab-horse and threw the animal to the ground. At the same time the metal rim of the wheel of the automobile flew 30 feet and strange to say encircled the heads of the two men, drawing them close together and hurling them to the pavement. Both of them were unconscious, and one of them was seriously hurt. This, at all events, is the report given by the daily papers, although the metal rim lassoing two men, as stated, looks rather doubtful.

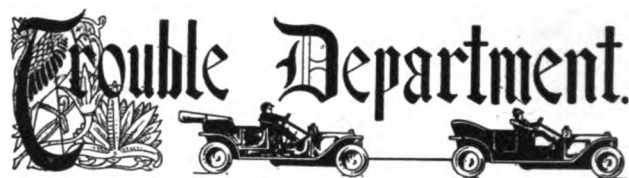
The Rear Tire Burst.—In Lorain, Ohio, three men were riding in a big car at the rate of thirty miles an hour, when in attempting to turn a dangerous curve, the rear tire burst and overturned the car. The occupants were all more or less injured and were taken to a hospital, while the car was pretty well wrecked.

Air Locks.

After completely emptying the cooling system—there should always be a tap at the lowest point for this purpose—upon refilling, difficulty from air locks will often occur. To overcome this a tap should be placed at the highest part of the radiator, so that the imprisoned air can, when the cock is opened, be allowed to escape. It is also a sure test as to the efficient working of the pump, when, immediately the tap is opened, after the engine has been running a few seconds, water issues forth.

The seats of inlet and exhaust valves should be polished with Dixon's Motor Graphite. This precaution largely prevents burning and pitting, and obviates leaking and loss of compression.

During the hot months care should be taken that sand blisters don't ruin the tire.



This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Inquirers will please write plainly and give full particulars of their trouble, stated as clearly as possible.

553 Use a Grease Rather Than Oil.

From J. E. Baer, California.—I am driving a Model 10 Buick 1909 model. The longer I use it the better it is. Have no trouble whatever with it with the exception that the left hind wheel throws out oil to beat the band. I have let a great deal of oil out of the differential, have taken off the wheel and found there are a felt washer. This seems to be in good condition. I put a piece of leather in behind the washer thinking that when the wheel was on it would squeeze the felt and make it tighter, but it seems to do no good. If you can tell me a remedy for this trouble I will be very thankful to you for same.

Reply.—Using a non-fluid oil will help you, as probably the oil you use is too light. Most differentials can, to advantage, be packed in heavy grease and graphite. Try putting a well-fitting felt washer behind the outer bearing or the rear axles. Take out the bearing on the shaft and fit a washer to the shaft and to the inside of housing. It may stand two or three such washers. Then put back the bearing. If this does not stop it, the differential should be dismounted and the inside bearings looked at and, if possible, replace the washer to keep the grease from working out.

554 Misfires on Open Throttle.

From T. B. L., Ohio.—In my Brush model D, when running with open throttle, it will miss fire badly and the charges explode in the muffler. I found some trouble with the coil connections, but that is all. I carry eight batteries in two multiples on one set. Each one tests over 12 amperes. Kindly help me in this matter if you can.

Reply.—Your trouble is probably due to a leaky exhaust valve. It may be held open by a bent stem or other causes but the chances are that a proper grinding will correct your trouble.

555 A Cylinder Misses.

From Crawford Auto Supply Company, Iowa.—I have had trouble with my Reo, 1910 four-cylinder, one cylinder missing. It will run very slow and pull on all four cylinders, and if I run 25 to 30 miles slow she will pull on all four most of the time. Some days she seems to take spells and runs fairly good. By pushing the gas lever forward and back several times and getting more speed, she usually will take hold and pull on all four cylinders. I also find it will fire four cylinders with three spark plugs in. In taking spark plug No. 2 out, the cylinder will continue firing on moderate speed, putting in plug No. 2 and taking out spark plug No. 1, she will act the same way as mentioned before. Fire will come out of spark plug hole. The engine running slow and medium speed, pounds and knocks. It sounds and feels like pregnition. This is impossible as everything is clean inside. Could there be a hole in cylinder so one would fire

from one to the other or could it be possible that it is not getting the right mixture of gas that would cause it to fire back in through the manifold and cause the other cylinders to fire while drawing in its charge?

Reply.—Your case as stated is not altogether clear. The conclusion drawn at first would be that the cylinders fire in their order of position from front to rear, which seems impossible. The fact that the cylinders fire with plugs removed, would seem to eliminate any trouble in the ignition system, making the firing due to some other cause, probably a break in the cylinder wall, as you suggest. With cylinders firing in the order No. 1-2-4-3, when No. 1 is on the firing point, No. 2 has drawn its charge and started on its compression stroke and thus a leak between No. 1 and No. 2 cylinders would allow some of the burning charge to ignite the charge in No. 2 cylinder, which would cause knocking; also leave no charge to fire at the proper time, causing a miss in No. 2 cylinder. With No. 1 plug out and not firing, the charge from No. 2 could be partly forced through the leak and out through No. 1 plug hole. With the cylinders firing in the order No. 1-3-4-2, the order in the first two cylinders would be merely reversed, the fire from No. 2 exploding the charge in No. 1, etc. If there were any trouble in firing back through the manifold pipes, it would be noticed in either the carburetor or muffler. That all four cylinders fire in their proper order at times might be due to the expansion of the metal from the heat sufficiently to close the leak in the cylinder wall.

556

Carbon In the Cylinder.

From C. M. E., New York.—I have a model R Ford and the motor runs nice and smooth after running a while, say an hour or so, when I turn off switch motor continues to run for a minute or so and has a racking, knocking noise, as though one cylinder was firing and forcing the crank around. If I start the motor and let it run for a few minutes and stop, it does not do this. Can you advise what this might be? I might add that I start the motor when warm about six out of ten times by merely turning on the switch.

Reply.—No doubt an accumulation of carbon in the cylinders and firing chambers, causes the heating and the firing of the charge after the switch has been turned off. Clean the carbon from the cylinder's piston heads and firing chambers. This should remedy your trouble.

557

Front Cylinder Does Not Fire.

From J. F. Sharp, Iowa.—I have a model T Ford, 1910 model, which has been giving me some trouble by the front cylinder not firing every time. It seems to only fire every other time. If I take out the other three plugs then the cylinder will run the engine and explode every time and work fine, but by putting the plugs all in place and holding down the vibrators two at a time the front cylinder will only fire every other time. Have had some good men work on my car and it will at times hit on all four but soon gets to missing again. The plugs keep getting badly sooted and oil seems to get on the front plug very badly. Now if you can think, or any of your subscribers have had this trouble, please let me hear through your paper in the next issue.

Reply.—The writer had trouble of a similar nature which was overcome by putting in a new set of well fitting rings and reducing the amount of oil in the crank case. He also used soot-proof plugs to good advantage.

558

A Knocking Engine.

From C. N. Hertert, Nebraska.—I wish you would explain to me as near you can the following trouble I have with my model T Ford car, 1910 model. The engine seems to knock after getting the bearings and the connecting rods tightened up, and we have had the car apart five times trying to adjust the bearings and the rods, in order to stop this knocking. The car pulls good up any hills, runs nicely, but the knocking keeps up right along. It seems to get worse, the more the car is run. If you can explain this to me, kindly do so and oblige.

Reply.—Your trouble seems to be a loose bearing that you have overlooked. Examine the wrist pin bushing and cam shaft bearings. If all these are in good shape, I would advise your consulting some reputable repair man who doubtless will locate your trouble in a short time.

559 Weak Batteries and Gasoline Consumption.

From Edward J. Merriam, New York.—Here is a poser for your Trouble Man, that I am gambling he won't be able to answer: On my model 36 four-cylinder Elmore car I recently had installed a model D Schebler carburetor, with excellent results, except for the fact that it consumed too much gasoline—eight or nine miles to the gallon. I also found that my batteries were running down very rapidly. Careful investigation showed me where the power was leaking very badly through a short circuit. I immediately remedied this with surprising results as to additional power that I seem to get from the ignition, and in a ride of forty miles immediately after repairing the above mentioned short circuit, I increased my mileage to twelve miles to the gallon.

Now, as a matter of information I would like to know why weak batteries called for more gasoline and why I used considerable less gasoline for the same number of miles when I got the full power of the ignition, which, by the way, is the Atwater Kent system. I shall be extremely obliged if you can satisfy my curiosity.

Reply.—A weak spark due to insufficient battery power will use more fuel than a hot spark for the reason that, with a weak spark it does not produce an explosion at the instant it is made in the cylinder but produces a slow burning of the mixture with the result that the pressure in the cylinder is considerably lower, causing over-heating of the motor with a noticeable absence of power and at the same time consuming more gas than necessary. A considerable portion of the charge will escape unburned or only partly oxidized, to the muffler, whereas with a good hot spark, combustion occurs immediately and the mixture is completely ignited, furnishing the necessary power at a less fuel consumption.

560

Leak in the Battery.

From S. Gladney, California.—I bought a model 49 Overland car last Thanksgiving and I am now using my fourth set of "Ever Ready" dry battery and it is about used up. The battery consists of five cells.

I had used up the third set of batteries at the end of the first 90 days and had run less than 500 miles and used the battery only for starting purposes, then switching to the magneto. Since putting in the last set of batteries I lined the battery box with paste-board so the cells did not touch the sides or bottom of the box anywhere, but still the battery is fast going

weak. If you can tell me what the trouble is I will be greatly obliged.

Reply.—Your trouble is evidently a leak in your battery circuit on the car, either along your wiring or in the switch itself. It very often occurs that a strand will become loose from a wire and short circuit to some metal that will form a ground, so look to your positive wire to the coil and trace it out and see if it does not touch somewhere the metal of the car. It sometimes occurs that a coil itself will get grounded, but that trouble will only be apparent when the battery circuit is in use.

561

Electric Light Trouble.

From A. J. McKinney, Illinois.—There are several Ford automobiles here equipped with electric lights direct from the magneto. They all work good except one. It burns out the bulbs in about one-half mile run at not over ten to fifteen miles per hour. We are using 6 volt 6 candle power bulbs. To keep them from burning out, should we use more voltage or more candle power, and how much more would you recommend?

Reply.—It is evident that the one Ford on which the bulbs burn out so quickly, has a magneto so would or connected up as to generate an excessive voltage. We would advise that you test the voltage of the magneto in that car (with motor running at normal speed) and then procure bulbs of such higher voltage as may be necessary. The voltage of the bulb should be approximately equal to that generated by the magneto.

562

Trouble With a Certain Cylinder.

From Crawford Automobile Supply Company, Iowa.—We have a four-cylinder Reo, 1910, and have had trouble with the ignition. The coil and magneto is a model D Splitdorf, and have had trouble with No. 2 cylinder, although sometimes the No. 2 cylinder will work, as will all four cylinders without change of spark or gas for several rods. It seems that the spark on No. 3 wire, or the spark plug, is weak. We have changed wires but the spark seems weak just the same. We have changed the carburetor—it is Stromberg—a hundred times, but the way we have it now she seems to work best. By spells at night the spark jumps from the coil to the speedometer chain about every other revolution. We think the trouble is between the distributor and the plug, but we have been unable to locate it. When running 25 to 30 miles an hour, when the engine does not have to pull too hard, giving the gas lever a few quick jerks and more gas she will take hold and pull on all four cylinders, and will possibly pull up a fair sized hill, that is, if she still has good speed. Give us all the information you can and we hope you can give us something we have not tried.

Reply.—In the case of trouble with a certain cylinder on a motor it is well to look to the valves and be sure they are tight and seat when closed with the usual compression in the cylinders. Examine the inlet gasket on the manifold and be sure it is tight and do not allow an excess of air to impoverish the mixture drawn in. Providing the plug is good and the porcelain not cracked, or the wires broken, and the segments on the distributor clean so that the wiping brush gets a good contact, your motor should run. For if your trouble is in the magneto, it would not affect one cylinder alone. Your trouble appears to me to be a leaky inlet gasket.

563

Motor Misses.

From Laue Bros., Illinois.—We have a model H 1909 Jackson car with Schebler carburetor and model E Splitdorf magneto. Our motor misses on an advanced spark when running on the magneto, but runs all right on the batteries. When we get the spark lever about half way advanced on the magneto she begins to miss. The magneto and brushes seem to be in good condition. Please tell us what you think the trouble is.

Reply.—If the magneto is in good condition with contact points all clean and properly adjusted, I would consider your trouble a case of weak or demagnetized magneto. I would suggest that your magneto be sent to the maker to have the magneto remagnetized or replaced.

564

Poorly Fitting Rings.

From E. B. Knapp, Connecticut.—Will you kindly tell me how I may fix my model B "Sturdy Northern" runabout which was made in 1904 or 1905? I have just purchased a new cylinder piston and rings, and after getting it all together I found it would not run. The batteries, coil, spark plug and valves are all O. K. What can be the trouble? When she fires, the charge escapes past the rings back into the crank case. I thought first that the valves were out of time, but after looking it over found them to be all right.

Reply.—Your trouble is evidently a loss of charge and compression through poorly fitting rings. Rings not finished after cutting often show high places at the cut ends and on the opposite sides, leaving intervening spaces open to leak. Properly fit the rings and you will probably overcome your trouble.

565

Water In the Cylinder Oil.

From L. B. W. & Sons, Michigan.—We have a Buick 17, 1910 car, which was run about 2,500 miles last year, and this spring when cleaning up the car we found water in the cylinder oil when we took the oil from the crank case. We thought it might have gotten in through the oil tubes when we washed the car, but after running it about 125 miles we had the misfortune to break the crankshaft in the rear bearing, and when we took the oil out and the crankcase off we found water in the oil again. Can you tell us the reason of water being in the cylinder oil? The cylinders seem to be in first-class condition. When we took the oil out, the bottom of the crankcase was so hot we could not bear our hands on it. Would this non-lubrication, due to the water being in the oil, cause the bearings to heat and stick, thus causing the crankshaft to break? The car was standing still when the break came. The driver noticed the motor not running steady and was looking after the trouble when the motor stopped suddenly. The car was just inside the garage after coming in from a trip when this happened. The driver did not notice the motor running unsteady when out on the trip, it seemed to run fine until the car stopped in the garage. If you can tell us a remedy for this trouble, it may save us from further accidents.

Reply.—The water probably got into your oil in the crankshaft from the pump, which in the model 17 Buick leads through the casing to the crankshaft. This should be looked after to see if the packing is tight and does not leak, for if it does the leakage will find its way into the crankcase through the pumpshaft bearing. This impoverishing of the oil by a quantity of water will have a tendency to cause the

motor to heat, and if the bearings are snug-fitting, may cause them to seize and stick. Care should be taken that the oil pump is working right and circulates at the proper rate. Crankshafts as a whole will stand great strains, and in yours it may have been cracked for some time and when the bearings tightened up, it broke. A crankshaft has a tendency to crystallize, especially those made from Vanadium steel, and will sometimes become as brittle as glass and when any undue strain is put on it, it generally parts.

566

Battery Queries.

From H. R. Beall, Kansas.—I would like to ask you a few questions about a subject of which I am very much in ignorance of, and which any of my motoring friends seem to be equally ignorant of. It is in regard to the output and rate of flow from dry cells. I will try and make my questions as clear and brief as possible.

1.—If one dry cell shows an initial amperage of 20 amperes on an ammeter reading, does this mean that this cell would deliver 20 amperes current for one hour or at the rate of one ampere for 20 hours?

2.—If 6 dry cells showing an initial amperage of 20 amperes each were connected in series with positive pole connected to negative and one wire to coil and the other to ground, would the amperage of these cells be 6x20, or 120 amperes, and would they deliver current in proportion and last six times as long as one cell would with an adjustment drawing the same amount of current?

3.—If a four-unit coil on a four-cylinder motor is adjusted by the use of a low reading ammeter, through the vibrators so that each unit draws .5 of an ampere, does that mean that each unit is using .5 of an ampere per hour, or a total of two amperes per hour for the four units, or do all four units only draw .5 ampere per hour altogether?

4.—With six dry cells of 20 amperes each connected as above and coil adjusted to draw .5 ampere, estimating the speed of a car on the average of 20 miles per hour, how many miles should this set of six dry cells drive the car, supposing of course that the wiring was all perfectly good and there was no possible chance for leakage of current?

5.—If this coil adjustment was made with the engine running idle and not very fast so that the coils each drew .5 amperes, would the rate of consumption of current be the same at higher or slower engine speeds? Or in other words would the rate of flow be the same if you drew the car at 10 miles per hour or at 30 miles per hour?

I do not know whether I have made these questions very plain or not. It has always been a puzzle to me in regard to these things which I have asked you about and I have been unable to be set right by anyone whom I have asked here.

Reply.—No. 1.—A dry cell is not like a storage cell which is charged with so many ampere hours, and the amperage reading of the cell will indicate what this capacity is. If a cell registers 20 amperes or an ammeter, this shows the internal resistance of that cell at that particular time, and the life of the cell cannot be determined. By slight changes in the contents of a cell, the initial amperage can be increased, but the length of life is decreased, as polarization will set in so much quicker. The claim is that a cell which registers from 10 to 22 amperes, is apt to be better than one which registers over 22 amperes, as it indicates an improper proportion of the ingredients.

2.—In your question No. 2 you probably had in mind the connection of the cell in multiple, such as if the carbons of the other cells, and the zincs to the zincs of the other cells, the effect would be to make one cell four times as large as each of the four so connected. By this method increased amperage capacity is obtained and a longer life for a given current output. As with your way of connecting them up by a carbon to a zinc, the voltage of the six cells is shown and the amperage that of two cells.

3.—Each unit draws five-tenths of an ampere.

4.—The life of a dry cell cannot be determined and it would be mere guess work to try and tell how far they would run a car.

5.—At high speed the rate of flow would be greater than at low speed.

567

A Slipping Clutch.

From L. A. Maxfield, Michigan.—Last year I began to be bothered with the high speed slipping and I wrote to the company (Thos. B. Jeffery & Co.) and they suggested a new facing and I had it put on but it still slipped so this year I put in a new high speed spring, but yet it slips. If I put rosin on it before I start it will hold until I put it up to low, then when I throw it on to high again it will start slipping unless I put more rosin on it again. Would you suggest using Grey's Clutch Compound? I have heard this is good. Have tried Castor Oil but it don't help any. Any suggestion you may give me on the above will be greatly appreciated.

Reply.—The remedy for a slipping clutch depends much upon the cause. Rosin should never be applied to slipping clutches. It will grip fiercely at first, but when it gets warm it will slip more than ever. As your clutch seems to slip only when on high, the spring is probably too light or has insufficient tension. The adjustment of a clutch is something that requires care and judgment. Clean all the rosin off with kerosene, and soak the facing with oil.

568

Mention and Merit.

From David Nelson, Phillips, Nebraska.—I have been watching your magazine for a word from a Mitchell owner, but have failed to see it. Is it because the cars are perfect that they do not show up in the Trouble Department? I own a model T, 1910 Mitchell and for the eight months I have had it the car has not shown any kind of trouble. I would like to hear from you a word as to what you think of a Mitchell.

Reply.—The Mitchell is a good car. Our friend should understand, however, that the merit of a car can by no means be determined by its mention or non-mention in the Trouble Department, although its mention there is in its favor, for it indicates to some extent that a large number of such cars are used.

569 New Transmission Case for a Pope Tribune.

From Reader.—I would like to ask the following through your journal: Can a progressive type transmission in a model X Pope Tribune car be replaced with a sliding gear, or preferably a selective type transmission, and will some one give me a price on same? If this cannot be done, where can I get a new transmission case for this auto? Do not like the progressive type and would much prefer to make the change. How can I add to the power of this car?

Reply.—Although it might be done, the change would not be advisable. It would be expensive and

the result would not be enough better to pay the cost. In some cases, power has been added to a car by changing the gear ratio, but whether this is advisable depends much upon the construction and strength of the motor and other parts of the car. We have yet to hear of any one making such changes to their cars without later regret or confession that the result was not commensurate with the cost.

570

Not for Lighting.

From W. E. Waffle, Michigan.—I have an E. M. and F. 30 h.p. 1910 car. Can I attach electric lights to my Splitdorf magneto, and if so, in what way?

Reply.—The Splitdorf magneto is not designed for lighting purposes. It is everything to be desired for ignition purposes but should not be used for electric lighting.

571

Oil Burns Out of the Crank Case.

E. W. W., Wisconsin.—I have a Ford car which has an unusual trouble and would like to hear from you in regard to the same. In an hour's run the oil will all be burned out of the crank case. The water circulation is good and it never boils. The bearings are all free, as we had the engine all apart to test the same. Outside of the over-heated crank case the motor runs fine.

Reply.—The loss of oil from your crank case is due to poor gaskets or packing in some of the joints. It would be well to fill with the usual amount of oil, then start the motor and watch for the leak in either the motor or transmission.

572

Compression and Space.

From Wm. T. Wintringham, New York.—What would be the compression in a gasoline engine where the compression space is one-third of the piston displacement—that is, one-fourth of the total space? Should it be four atmospheres (about 59 lbs.) as a pressure gauge would show, or should it be one more atmosphere (about 73 lbs.) which a gauge in a vacuum would show? Given a perfect mixture what would be the explosion pressure?

Your reply will oblige me, and I think would interest other readers, if published.

Reply.—If your compression space is one-fourth the total, you would figure one atmosphere as normal, or 15 lbs., then compressing this into one-quarter of the space would give a pressure of 60 lbs. You could not consider a vacuum in this case unless the entire motor were in a vacuum. With as perfect a mixture as is possible to obtain from the ordinary carburetor, the expansion would be about four and one-half times the compression, or in this case, 270 lbs.

573

Noisy Transmission.

From J. E. Perry, Illinois.—I own a model B, 1907 Reo runabout. I have run it three years and this spring had it overhauled. It was necessary to send for three new discs for the high speed planetary transmission. Now they make the same noise in throwing in the clutch that the old ones did that were cutting. I would like to know if they are in wrong. The gears in the slow speed and reverse transmission, the garage man said, are not worn to speak of. I have always used the car with care. Now they make much noise when the engine is running and when using the slow speed they are very noisy. Can you give me an idea of what is wrong?

Reply.—No doubt the noise you now hear in your

transmission is only due to the changed position of the bearing surface on the teeth of the gears caused by the installing of the new parts. This is very often the case in the planetary transmission and should cause no alarm as it will soon wear in and the noise will stop.

Still Cleaves to the Spur Gear.

From "Betsey Bobbett," New York.—My thanks are due Mr. C. J. Pembroke for his able defence of the bevel-gear differential which has considerably modified my views. Not being a trained engineer, it would be futile for me to argue, still, a woman can always hold to her opinion, and as yet, I am not ready to go back on such a good friend as the spur-gear differential which in four cars has carried me over 40,000 miles of meanderings in the States from Maine to Virginia inclusive, without one moment of trouble.

Lonesomeness in my spur-gear way of thinking is not so bad when I have for company such good people as the Pierce Arrow, Peerless, Steven's-Duryea, Franklin, Winton and Pope-Hartford, which is surely a goodly array, even allowing that all the others use bevels.

Practical Vulcanizing.

From S. C. Woodard, Wisconsin.—I want to agree with Mr. Doane, whose reply to No. 509 appears in the April issue, that a good, reliable vulcanizer is about the most important part of any motorist's equipment. Although my vulcanizing experience has been gained in an amateur way, I think it has been sufficient to warrant me in saying a word or two in behalf of some of the vulcanizers that heat from an electric lighting circuit like a flat-iron or those that are heated by some kind of a lamp. I have used both kinds with very good success and am thoroughly convinced, and my opinion has been borne out by tire manufacturers whom I have talked with, that vulcanization is dependent on the use of the application of pressure and heat at a certain temperature for a certain length of time.

I find that my electric vulcanizer has a great many advantages over some others I have seen. For one thing I can put it on a tire in any position. Then I don't have to waste a lot of time keeping the temperature within limits. I can put it on a tire and go to dinner while it does the work. The automatic controller keeps the temperature just right and I don't have to worry about its getting hot enough to burn the tire.

A talk with a vulcanizing expert at the auto show last winter gave me a few pointers that may be worth while to some one. Among other things that I found out was the fact that in vulcanizing plants where large sectional and retreading repairs are made great care is used to keep the repair free from the slightest trace of moisture, which might prevent the repair from sticking to the tire and welding into it. Then too, my own personal experience seems to indicate that the temperature only of the vulcanizing surface determines the success of the repair.

I may be wrong on some of these points, and if so I wish some one would correct me as I am after information. There is one sure thing and that is that my Shaler does just as good work as could be done with any apparatus and is in every way satisfactory.

His Leaky Carburetor.

From L. B. L., Ohio.—Tell P. C. B. of Michigan that the trouble of his leaky carburetor in his Brush car is a worn gasoline float needle. If this is re-

placed his trouble will end at a cost of 50 cents. This needle being worn allows the gasoline level to come up too high before the valve is closed, and the gasoline runs over the top of the nozzle and drips off the bottom. If you do not want to replace the needle, try bending down a little bit the lever attached to the float so that the gasoline level is not so high. But this is not a good plan. Better get a new needle.

Costly Tire and Gear Experiments.

From Edgar C. McCall, New Jersey.—Having been advised of the benefits derived from large tires I bought a pair of 29x3½ tires for the rear wheels of my 1910 AA Maxwell Runabout. (This car comes with 28x3 tires back and front.)

I found that they slowed the car quite a bit on hills. In other words you had to go into low gear sooner than with the smaller tires. This was because the difference in diameter of the wheels was almost two inches.

This car is geared (on high) 4.2 to 1, or a 10 tooth bevel on propellor shaft driving into a 42 on differential. I had a 9 tooth gear made and fitted with some trouble as the smaller gear has to lie closer to the differential gear. It meant a new bearing for the propellor shaft.

This 9 to 42 worked like a charm, did not seem to make much difference at full speed and I could take hills on "high" which before were impossible except on "low."

One day about five miles from home I heard an ominous crack and discovered a broken tooth in the 9 gear. Fortunately I was able to get home without a tow.

I have gone back to my old 10 gear again and will not experiment further with "home made" gears. Unless I find a big advantage financially in the 3½ inch tires, I shall probably go back to 3 inch when these are worn out.

Uses Kerosene to Prevent Carbon.

From W. G. Thomas, District of Columbia.—I desire to say for the benefit of your readers that I run a No. 10 Buick Car for one year and never had to grind the valves or remove them at any time. In my judgment I owe it to using kerosene for cleaning out the carbon and I also used a little kerosene on the valves two or three times each week.

Friction Drive.

From E. R. H., Vermont.—G. H. Curtis in the April issue, page 62, says he cannot use all of his power and asks in regard to more speed ahead. As a user I can say, you can use all the power you have with friction drive, and can have any gear to fit any road, and without noise and start anywhere even if in the middle of a hill.

A Two-Cylinder Orient.

From E. R. H., Vermont.—Some time ago some one asked help in regard to the two-cylinder Orient. I helped one of the engines by setting the valves so it would open quicker by moving the cam gear wheel ahead one tooth. The valves are very late in opening as made. If that party wishes a more help and will write, enclosing a stamp, I will give it if I can.

A Suggestion.

From E. R. H., Vermont.—I would like to make a suggestion to F. J. Claussen in regard to his article

in the April issue, page 64. Let him have his gas pipes enter the top of the oil can and put in a handful of carbide once in a while to take up moisture and turn it into gas.

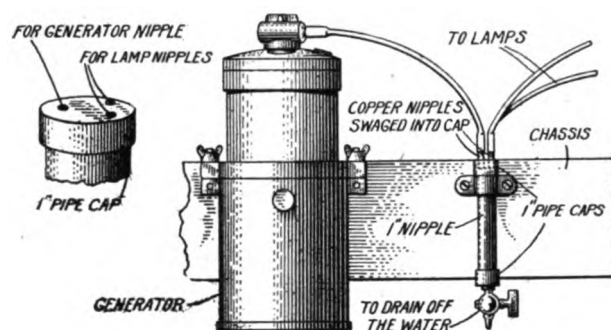
Care of Gas Lamps.

From E. R. H., Vermont.—When leaving lamps (gas) is it best to blow them out or let them burn out, after turning off the water in the generator?

To Keep Water from Lamps.

From H. M. Kebby, California.—In your last number you have a letter from Mr. Claussen showing how he kept the water from his gas lamps. I had the same trouble and enclose a sketch, showing my method of overcoming it.

Take a 1 inch pipe cap and drill three holes for ⅝ inch copper nipples 1½ inches long, so they will be a tight fit. Drive them in so they project ½ inch below the inside of the cap. Then swage them with a punch,



so they will remain tight. The rubber tubes from generator to lamps fit over them. Take another cap and tap for ⅝ inch pet cock. Screw them on to a 1 inch nipple 4-inches long, and clamp to the chassis as shown, so that the top will be at the lowest point in the gas system. Connect up as shown, and all water in the pipes will drain to the separator from which it can be drained by the pet cock. The separator also acts as a gas reservoir to equalize the pressure on the burners.

Tire Destroyers.

Although a careful driver will examine his car to see that the tires are not underinflated and will provide against overloading, and will remedy any defect in the rims, there are other things to be considered if one wishes the tires to last long. The dashing driver who starts with a jump, throws on the high gear within a short distance and, when stopping, drives almost to the desired point, then slams on the brakes, will find that his tires will not last as long as his more careful friend.

To put on a high rate of speed suddenly on a slippery pavement or a sandy road so that the wheels fly around while the car is barely moving, is not conducive to long lived tires. The man who runs his machine in the ruts along the country roads, so that the sides of the tires scrape against the sides of the ruts and the man who bumps the sides of his tires against the curbing of the pavements—an exceedingly common fault—also will find that his tires die a sudden death.

Better to get a puncture running slowly on a bad road than to have a blow-out running fast on perfect macadam.

Wiring Splitdorf Magnetos.

A reader asks us to give wiring directions for a Splitdorf magneto. Herewith will be found wiring diagrams for the different models of these popular magnetos, and it is suggested that they be preserved

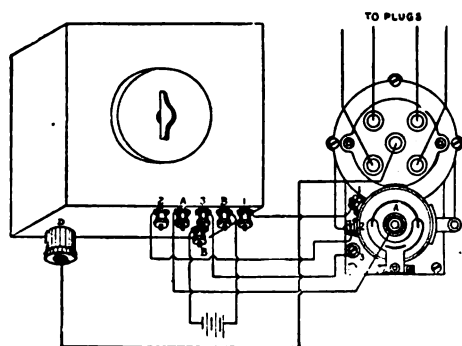


Fig. 1—Wiring Diagram for Model B Magneto with Vibrating Dashboard Type Transformer.

for possible future reference. It may be remarked, however, that the manufacturers will send without cost a book of instructions for installing and operating these magnetos by addressing the home office or any of its branches. The following instruction in relation to the care of these magnetos should be faithfully followed:

Don't test your magneto unless you have it com-

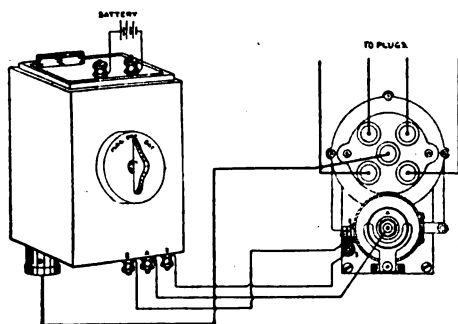


Fig. 2—Wiring Diagram, Model D, Magneto.

pletely assembled, i. e., breaker box in place and distributor cover with wires attached.

Don't think it necessary when washing the car to flood the magneto with water. All high tension instruments work better when not flooded with water. This will be thoroughly appreciated by those who have driven with the old type coil ignition.

Don't open up the spark plug gaps nor permit them

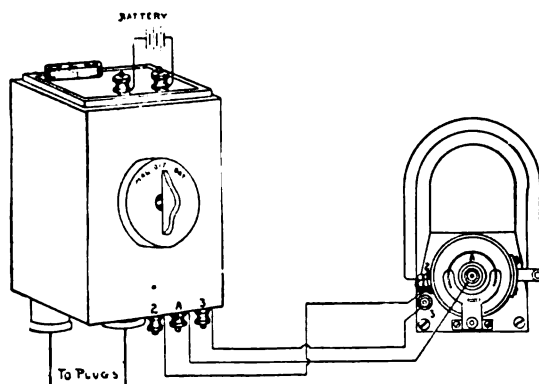


Fig. 3—Wiring Diagram, Model G.

to burn themselves open more than 1-32 of an inch. Don't flood the breaker box when oiling the little roller on the breaker bar. The oil should be applied with a toothpick about once a month.

Don't expect your magneto to operate if you permit

the frayed ends of your wires to come in contact with each other or the little parts of the instrument.

Don't dissect the instrument to see what makes the wheels go around, unless you are an expert. We put the right number of wheels inside when we make it. Don't drive the motor with the spark retarded, but

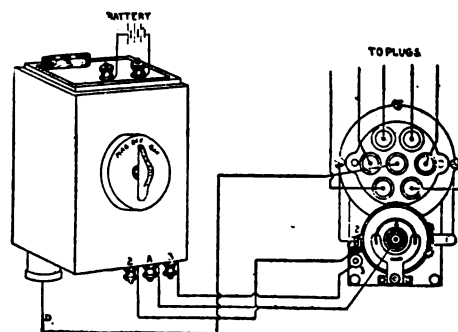


Fig. 4—Wiring Diagram, Model S or SS.

as far advanced as the motor will permit.

Don't leave your switch turned to battery over night. Be sure it is in the "off" position.

Don't try to improve the adjustment of the platinum points in the breaker box. This means a cool motor unless they are less than 1-32 of an inch.

Don't disconnect the wires leading from the mag-

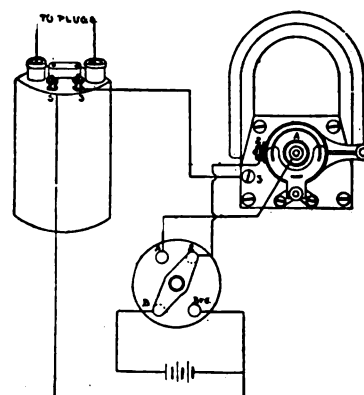


Fig. 5—Wiring Diagram, Model G Magneto with Tube Transformer.

neto to the coil, unless you are careful to get them back according to their respective letters. Crossed wires mean burned out connections.

Don't pull out the carbon brushes in the distributor

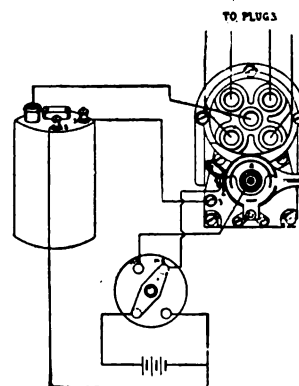


Fig. 6—Wiring Diagram for Tube Transformer Without Vibrator, Switch only Appearing on Dash.

because you think there is not enough tension on the springs.

Don't fail to put back your wire gauze brushes in the breaker box when putting the breaker box back on the magneto. Do not smash them over.

Don't pull out your switch plug until after you have placed your switch on the off point.

All moving parts of the Splitdorf magnetos are equipped with the finest type of annular ball bearings which are packed in grease while assembling. Nevertheless they have placed an oiler at each end of the armature shaft, and it will do no harm to put a drop of oil in the oiler, say once a month. Some of the models do not have these oilers, in which case it will not be necessary to apply any oil.

GEAR CHANGING.

Notes and Advice on the Subject by an Experienced Driver.

Before dealing with the actual *changing* of gear, which of course implies that a pair of pinions, or the dog clutches forming the direct drive, are in mesh when the gear lever is moved, it will not be amiss to refer to the operation essential to moving the car from rest, namely, the movement of the lever from neutral to a forward speed or into reverse. Referring to the accompanying diagram, which shows the various parts of a three-speed gear box, the clutch within the flywheel, and the coupling shaft, it will easily be realized that with the engine running and the car stationary the following conditions prevail:

(a) The clutch and intermediate or clutchshaft are rotating at the same speed as the engine, while the layshaft or secondary-shaft and gear wheels attached to the latter are rotating in accordance with the ratio of the constant mesh gearing.

(b) The primary-shaft and its gear wheels are stationary.

From Neutral to Any Gear.

This being the case, it follows that a noise will ensue if the gear lever be moved towards the engagement of first speed immediately upon the clutch pedal being depressed, owing to the rotating pinion A being pressed against the stationary pinion B. To ensure a noiseless engagement of the first speed both pinions must be stationary, and this will not occur until the clutch, intermediate-shaft, and layshaft have all come to rest. This state of things will naturally ensue within two or three seconds after the clutch has been disengaged if the pedal be depressed to its full extent, and then the first speed may be engaged without the slightest noise.

Instead of waiting for the intermediate-shaft and layshaft to come to rest, many drivers, probably the majority, simultaneously with the depression of the clutch pedal, force the gear lever into its first speed position, causing much noise and jarring of teeth, and probably a jerk forward on the part of the whole car.

Some cars are fitted with a more or less efficient clutch stop, or clutch brake as it is sometimes termed, and with such cars the period of hesitancy necessary between the depression of the pedal and the movement of the lever is more or less decreased. To determine the minimum pause in any given instance should not be a difficult matter.

It is sometimes remarked when the above advice is given, "Oh, but I find that if I allow the clutch to stop revolving in that way I cannot engage the first speed at all." This is quite true in some cases, and the reason is that the faces of the teeth of the gear wheels, through wear, have become flat, i. e., the chamfered edges have worn away, so that, unless the wheels come to rest with the teeth to be meshed exactly in the right line, the pressure of one against the other has no effect. The idea of the chamfered edges

is to give a "lead" to the teeth in such circumstances.

Another reason why difficulty is sometimes experienced in engaging the first speed from neutral when the pause is made is that not only is the clutch pedal depressed to its fullest extent, as it should be, but too great a pressure is exerted upon it, with the result that when a clutch stop is in position the shafts are practically locked. So that, although the chamfered edges of the gear pinions may be in perfect condition and the necessary "lead" available, no advantage accrues, as the wheels cannot be moved when they are pressed one against the other by the operation of the lever.

Therefore, if difficulty be found in engaging the first speed after pausing, as advised, do not press so strongly upon the clutch pedal as to lock the shaft; then probably no trouble will be experienced. If difficulty be still experienced, it may be taken for granted that the teeth are worn as first suggested (or have not sufficient chamfer). In that case let the clutch in again a very little way, so that the internal friction of the clutch bearings may, when the movement has been made sufficiently to render the "stop" inoperative, cause the clutch shaft to rotate slowly; the constant mesh gears will then rotate the layshaft and the gears should engage with only the faintest indication of jarring or noise.

The difference between the ratios of the first and second speed necessitates that either the speed of the primary shaft shall be increased or the layshaft decreased. Now we cannot speed up the primary because it is connected permanently to the road wheels, therefore we must cause the speed of the layshaft to be increased somewhat.

This diminution of speed is, by a number of drivers brought by forcing the second speed wheels C and D against one another immediately the clutch has been withdrawn, almost simultaneously with the depression of the clutch pedal. The noise that ensues, which of course is accompanied by unnecessary wear of the faces of the teeth each time it occurs, is only to be expected, but it can be entirely avoided if a somewhat similar practice be followed to that recommended in the case of the movement from neutral to first. The clutch pedal should be depressed to its fullest extent, so as to bring the stop into action, and the lever moved slowly, but with decision from first to second. It will be realized that the retardation of the clutchshaft cannot commence until the first speed wheels are out of mesh, so that the period during which the clutch stop is enabled to effect its purpose is very small, and if the stop be inefficient, or if no stop be provided, it is often advantageous to make a distinct pause between the gears, i. e., when the lever is in the neutral position.

In making *any* upward change which necessitates crossing the "gate" this pause is automatically brought about by the time occupied in the lateral movement of the gear lever, but where the change is by a direct backward or forward movement only, the habit of making a pause must be cultivated. It need be only very slight, and on some cars would amount to no more than a lingering over the operation.

To Higher Speed.

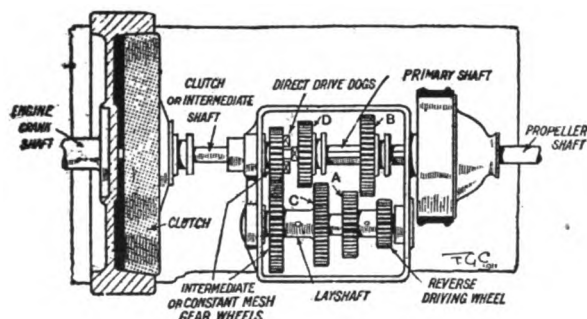
The change from an indirect gear to the direct drive, where the latter is by dog clutches, is a procedure which requires special mention, for, although the conditions prevailing before and during the change are the same as in any other upward movement, the square shape of the dogs and their small number, and consequently the small number of available points of engagement as compared with a pair of pinion wheels,

call for a firmer hold of the gear lever and slightly more "persuasion." A pair of dog clutches rotating at only very slightly divergent speeds, will sometimes kick off, or spread unless the lever be held firmly; before the driver has again brought them together for engagement the relative speeds may have changed, the faster have become the slower, so that it will be necessary for the clutch to be let in again to speed up the clutchshaft before the dogs can be enmeshed.

In leaving the subject of changing up it may be remarked that, as a general rule, having very few exceptions, the greater the difference in the ratio of any two gears the slower should be the movement of the lever or the longer the pause between the two positions. This accounts for the fact that one often hears complaints of a car having a noisy change only from first to second, for the ratios of these gears are usually the most divergent.

The foregoing advice had particular reference to changing from a high gear to a lower when hill-climbing, but it is evident that, under certain other conditions, such as when driving in traffic, the methods described cannot always be followed.

A very frequent situation is as follows: On top speed a car has been driven slowly through a town,



but, owing to traffic conditions, has been slowed down behind a vehicle moving at a lesser speed. This has necessitated releasing the clutch, with the consequence that a lower gear must be engaged before the car can "get away" again. Under such circumstances many drivers make more noise and experience more difficulty in changing than under normal conditions when ascending hills. The reason of this is that there is even more inclination in traffic than when on hills to depress the clutch fully when changing down, and it has been previously mentioned that this results in the clutch touching the clutch stop, so decelerating instead of accelerating the clutch and layshafts.

Therefore under the circumstances described the plan to adopt, when the moment arrives for a change down to be made, is: With the throttle open about one-sixth of its travel (or enough to make the engine run at a speed which would be described as "rather too fast" if the car were stationary), partially release the clutch pedal so that the clutch is almost engaged, and then move the gear lever slowly from one gear to another with only the amount of force that could be exerted by one finger.

The reason for causing the engine to run "rather too fast" is to ensure that it shall be running faster than it would be if the top gear were driving, so that the internal friction may, while the gears are crossing the neutral zone when the change is being made, accelerate the clutchshaft to the speed at which it will be running when the lower gear is in mesh.

To conclude on the subject of changing down, the driver should always remember that the clutchshaft

must be accelerated before the pinions are meshed—if this desideratum be not effected by one of the methods suggested (all of which use the engine as a medium) it can only be accomplished by forcing the two pinions together and compelling the ensuing friction and grinding to speed up the slower one. A brutal method, surely; far better take pains and adopt a well-thought-out plan, practicing it over until perfect gear changing is assured.

Engaging the Reverse.

The enmeshing of the reverse gear is an operation over which the writer has at one time and another seen (and heard!) a great deal of fuss and bother, and the difficulty experienced by some drivers is doubtless due to the fact that with many gear boxes the operation involves the enmeshing of one pinion with two others, either simultaneously or consecutively. If all three pinions be at rest, as two of them will most certainly be if the car be stationary, it is not difficult to appreciate that the engaging of them will not be an easy matter, for it is many chances to one that either one pair or the other will be in an incorrect position for enmeshment; that is to say, each tooth will not be opposite its space. Now if the clutch be fully depressed and the clutch stop be strongly brought into use the chamfering of the teeth will not allow those which are incorrectly placed to draw into one another. If the clutch be only slightly depressed, just enough merely to touch the stop, the various shafts will be free to rotate through the few degrees necessary to allow the chamfered teeth to register. When the gears will not engage immediately it is useless to jerk the lever to and fro in the hope that force will attain the end in view; instead of jerking the lever a light pressure should be maintained upon it and the clutch pedal raised gradually meanwhile, so that at the moment the internal friction of the clutch tends to rotate the shafts the pinions may be quietly engaged as the respective teeth and spaces become opposite to each other.

A great fault with many drivers is to attempt to engage the reverse after using a forward speed before the car has come to rest, or *vice versa*. This means that they attempt to engage pinions which are running in opposite directions! An utter impossibility, of course, to attempt which means noise, grinding, and wear.

Briefly to summarize all that has been recommended on the subject of gear changing:

From Neutral into Any Gear.

Depress clutch fully and move lever gently into the gear notch after a brief period of hesitation. Changing Up (from a low gear to a higher).

Depress clutch fully, and move gear lever slowly but firmly from one position to the next. Changing Down (uphill).

Depress clutch pedal very slightly with throttle wide open, and move lever quickly from one gear to another.

Changing Down (after a traffic check).

Open throttle slightly, and with clutch almost engaged move gear lever gently to next position. Reversing (when difficulty is experienced in the engagement of the pinions).

Depress clutch, put a light pressure on the gear lever, and while maintaining that pressure slowly raise the clutch pedal until the gears engage.

In conclusion, it must be impressed upon those who have not considered the matter that all noise and

shock in connection with gear changing mean unnecessary wear—unnecessary because it *can* be prevented by drivers who will take the trouble to use judgment and care in the various operations, instead of merely manipulating the gear lever and clutch pedal in a happy-go-lucky way. Wear is occasioned not only to the teeth of the actual gear wheels which are being operated but to the transmission gear generally, for a noisy change is usually followed by a jerk when the clutch is let in, with the consequence that the propeller-shaft, worm, or bevel drive, axles, etc., are all submitted to stresses above the normal. But apart from this, the unnecessary wear inside the gear box is a sufficiently serious matter to call for the adoption and use of some method which will obviate its occurrence.

AUTO ADVERTISING.

Real Information Wanted Rather Than Superlatives or Glittering Generalities.

From C. J. Pembroke, New York.—Were we to clip out the pictures of the different automobiles that appear in the various advertisements, the similarity of design would be so marked as to make a choice of cars extremely difficult. The entire collection would differentiate only as to type from that of a limousine to a runabout. We have arrived at a period of almost standard design as to outward appearance, which classes the picture of the machine as a practically worthless feature, but they as a rule represent the greater portion of the advertisement. That which remains is generally devoted to a few catchy sentences that convey no real information. The price means nothing without detailed information, and the entire advertisement is practically worthless to a prospective buyer. It only serves to let the public know that such a machine is made.

If the advertiser really has embodied in his product the features that go to make up a first-class car, why does he not give us the details of construction and the reason why the results produced are as stated? Would it not be a pleasure to read advertisements, if they would go into detail, be truthful, and tell us the mechanical reasons why we should buy the car advertised? But as a rule we simply get broad statements using up many nice but irrelevant words.

Assuming that the maker really believes an annular ball is better than a Timken roller, a Timken roller better than a Hyatt roller, the Hyatt better than the cup and cone ball bearing, the common ball bearing better than a plain bearing, the full-floating axle better than the semi-floating, the semi-floating better than the live; or if he believes that the selective sliding gear transmission is better than the progressive type, and either of them better than the planetary, or the three plate clutch of large diameter better than the multiple disc clutch of small diameter, or that either is better than a leather-faced cone or a metal to metal cone, or expanding, contracting or other band clutches; valves in the head, offset crankshaft, six cylinders, or any other feature of the motor, is better than some other construction, or that a unit sparking battery ignition is better than the vibrator kind, or a magneto that will start without the aid of a battery outfit better than one that will not, or that a honeycomb radiator is better than a tubular one, or thermo-syphon better than a pump system; or in fact, if he knows that a certain feature of any one part is better than a corresponding feature of a different construction, or if he thinks that one material is better

than another for a certain part, then he must have a reason for it. Understand, I mean a real explainable reason, and to intelligently advertise his car, he should give those reasons, instead of trying to get the public to purchase his cars for reasons used in most advertisements.

The following quotations were taken at random from several advertisements, none being from one that was otherwise instructive, so they represent the substance of the advertisement even if it is not the entire advertisement.

No. 1.—“When you buy a car you should buy for the future, figure the cost by the year, for that is the only right way. Cars that seem to be cheap are not nearly so cheap in the long run. Cars grow better with use, that is the experience of users. Its second year is better than its first, its third, fourth, and fifth as good as its second.” It is plain that this firm is telling you something that is not altogether a fact, for it would be impossible to construct a car that would be better the second year than when it was new, and to say that its fifth year is as good as its second, simply creates an impossibility. If a firm has no respect for reason when they are trying to sell you a car, what can you expect of the car?

No. 2.—“High tension magneto, shaft drive. Four speeds. Fore door and demountable rims.” As this was the entire advertisement other than the picture of the machine, and this maker has heretofore been a strong advocate of the make-and-break ignition, and the chain drive, this is merely a surrender to public opinion.

No. 3.—“We have been making high-powered cars exclusively for the past nine years and can say positively that our four years' experience in the manufacture of the six-cylinder cars make us know that they are far superior to any other type.” This maker, like others, cannot get it out of his head that some six or seven years ago, gasoline motors were unreliable and would rather lie down than work, so he tries to make the public believe that the motor is the only thing to take note of when buying a machine, while the truth is that it would be a hard task to find a machine equipped with a motor so poor as to need serious attention. It is no credit to the automobile manufacturer that the motors of to-day work so much better than those of ten years ago, for the reason that the cylinders, the pistons, connecting rods, crankshafts, crank-cases, cam-shafts, valves, valve operating mechanisms, and in fact every other part of the motors are the same to-day as they were then and what have made our motors so much more reliable are the improvements in ignition systems and in carburation, but I have yet to hear of the maker that will concede this fact. If they have some features that are different from ordinary practice that make for long service, why don't they give the details of construction?

No. 4.—“What other car of popular price will you so frequently see side by side with cars of seven passenger capacity?” So the car must be of excellent quality or the man who owns the expensive seven passenger car would not allow it to stand alongside of his.

No. 5.—“Built like a watch, full jeweled. A car with all of the class of the highest priced cars. All their excellence of design, material and workmanship, but built on higher lines, more facile in handling, more economical in up-keep. The smart light cob of the automobile stable.” They were not satisfied to have you think that this \$1,350 car was simply

as good as a \$6,000 car, but they thought it necessary to add that it was built on still higher lines. Now if we all believed in the accuracy of that advertisement, there would be no other car on the market.

No. 6.—“This car is more than worth its keep, is not built on the catch-a-dollar-if-you-can principle; is not built to sell at a price that looks tempting to those who know nothing of automobiles.” They go on with about four hundred words like the above, but not one word of details.

No. 7.—“Superb style. Dignified and classy appearance. With every mechanical quality and every known feature of comfort and convenience possible to automobile construction.” Now you who have paid from \$3,000 to \$6,000 for your cars can see that you have been buncoed, because for \$2,400 you could have purchased a car, which would never be surpassed by any other machine at any price, for these people have reached the summit of possible construction.

We could go on and fill a dozen pages with similar quotations, but these are enough to illustrate what I call worthless advertising, for inasmuch as the maker of the cheapest car is equally as unreasonable and superlative in his claims as would be possible for the maker of the most valuable car that is to-day produced, the public does not place confidence in any of them.

Then comes that class of advertising wherein much emphasis is placed upon the fact that their car is equipped with a magneto, until one would think that a machine with a magneto but without a motor would run better than a machine with the motor but without the magneto. So misleading is this to the average mind that a fellow here in our city, who knew nothing of automobile construction, but was otherwise of a mechanical nature, purchased a \$6,000 car, and while explaining its good points to a friend said, “If we ran out of gasoline on the road that would not bother us in the least, as we would run home on the magneto.” Another party (a lawyer, so not quite as much to blame) said that they only used the motor to start with and that after that they run on the magneto! You might imagine that a magneto is the only form of ignition worthy of being installed, while the average magneto is worthless unless some form of battery system be installed with it for the purpose of starting at cranking speed and for operating the car at low engine speed on the high gear. The magneto is, as it should be, found on most cars, but be it ever so good, and even if it is one of those that will start the motor at cranking speed, there should be on every car two systems of ignition, be it two magnetos, a magneto and battery system, or two battery systems, each being entirely separate and independent of the other. The so-called dual ignition, wherein the battery system uses the timer and the distributor of the magneto, does not fill the bill, for if this timer or distributor of the magneto gets out of order, both systems are made useless at the same time, because the batteries cannot furnish ignition if either of them is out of business, and the maker only puts the batteries in with the magneto for furnishing the current at cranking speed when the magneto will not generate its own current. Still he is prone to try to make you believe that two systems are at all times present and that you can run on one when anything happens to the other, which is not a fact.

The manufacturer can buy a magneto for even less money than would be the cost of one of the latest improved unit sparking devices for a battery system,

either of which costs about \$35, so you can see that the magneto is not as large an item as one might think, nor is it any better than the unit sparking devices above referred to.

The manufacturers seem to think that as soon as they have worn out the effect of one argument they must find another even at the expense of producing a decidedly inferior one, so believing that the magneto will no longer stand the strain, they have taken up the long stroke motor. Yet there is not a single argument in favor of a real long stroke motor. Most manufacturers know this and it is a good joke to see the effort of those makers of motors which have but one-fourth to one-half inch more stroke than bore to try to make you believe they are long stroke motors. I would not call a motor of long stroke unless the stroke were at least one-half longer than the bore. For example, say, 4x6. Then by looking at motor specifications you will see there are only two or three makers who dare to produce a real long stroke motor, and the rest are with motors of but slightly longer stroke than bore. The long stroke cry has the effect of keeping the public mind attracted to some foolish fancy instead of real merit in construction.

Then there is a class of advertisers, who may be making a very good car, but at the same time are using false arguments as to why some feature of their machine is better than the corresponding feature of some other. Take for example the offset crankshaft and the long stroke motor. Some three or four years ago a maker tried to show the advantage of the offset crankshaft by the use of a bicycle on dead center together with a non offset crankshaft motor also on dead center and then they showed another bicycle with the crank just past dead center. With this they showed a freak offset motor with a similar position of the crankshaft and tried to have you believe that they had truthfully shown the firing point in both motors and then asked in which position you would rather have your foot in reference to the two bicycles, claiming their engine was better for the reason that there was no dead center and their crank was started on the downward stroke when ignition took place. This of course anyone versed in mechanics knew to be incorrect, because rotating motion cannot be produced from oscillating motion and still avoid the dead center. Furthermore, in order to have an advance on the spark, they could not do otherwise than cause the timer to make contact before this dead center was reached and their designer could not but have known this. Any maker using the offset crankshaft, has at his command a sufficient number of good explainable reasons for using it, without using any misleading statements, and its advantages can be plainly explained.

An effort has even been made to make the public believe that a quart of gasoline will furnish as much power as a gallon so long as the quart is measured out in a measure of the same length as the gallon. Turn this into a motor and they would have us believe that an 8 in. x 8 in. motor is no more powerful than a 4 in. x 8 in. motor, while the facts are that it is just four times stronger, just the same as a gallon is four times greater than a quart, be the quart a long or a short one. Facts are facts and it takes more than a stroke from a professional advertisement writer's pen to change them. One of these facts that no engine designer can overcome, is that the stroke has nothing to do with the indicated horsepower of the motor, so long as we maintain an equal bore, equal compres-

sion, equal sized pipes and valves, together with an equal piston speed. In other words a 4 in. x 4 in. motor will develop exactly the same horsepower as will a 4 in. x 8 in. motor, if the conditions mentioned are equal.

As the designer of the short stroke motor can carry his compression just as high as can the designer of the long stroke motor, both being limited at that point where the heat of the compressed charge will cause it to become ignited, and as both can operate their pistons up to a speed that is only brought to a stop by the point of safe lubrication, then bore for bore, both will have the same power, while the long stroke motor will weigh more by reason of the cylinders, connecting rods, crankshaft, crank-case, fly-wheel, pistons and other parts being either longer or larger, and in this way will not be so economical, because a great deal of its own power will be used to propel this greater weight and the tires will wear out quicker, sustaining the greater load, making another expense to be added to the cost of operating the long stroke motor.

They go on to say that the same cartridge will not shoot as far when fired from a revolver as when fired from a rifle, but they do not tell you that the ball never comes back to perform the same function over and over again, and that it takes power to return this ball piston in a gas engine. Neither do they tell you that this ball must go out again to the end of that long barrel and perform more work, that of sucking in the new charge of gas, and of compressing the new charge, all of which work and friction would more than consume the small amount of pressure that still remains after the exhaust valves open in a well-designed motor of the short stroke.

They do not tell you that while they use the longer stroke, it is absolutely necessary in order that they avoid a back pressure when the piston starts back on its exhaust stroke, that they must open the exhaust valve on exactly the same percentage of the power stroke as does the shorter stroke motor, for in order to have the same compression the volume of gas contained in the compression space must be greater in exact proportion to the amount that the stroke is longer. Thus they have a greater amount of exhaust gases to get rid of, because the volume of expanded gases will be in exact proportion to the volume of compressed gas at the time of ignition, and as the size of ports can be the same for both engines, and as gases will always travel through the same size port at exactly the same speed while under the same pressure, it is ridiculous for the advocate of the long stroke motor to say that he uses the gases longer or that he reduces them to a lower pressure. For every other condition being equal, except the length of stroke, all of these conditions will be exactly equal in proportion; or to be more clear, the pressure of the gases within the cylinder as well as the speed of the gases through the ports will be the same in both motors at every relative position of the pistons. In this last statement I assume that both engines lose the same percentage of heat to the cylinder wall, but as the long stroke motor will lose more heat to the wall of the cylinder, the pressure within the cylinder will be slightly lower at the time the exhaust opens. As this further reduction of pressure is not productive of power at the crankshaft, it represents a loss.

Take two motors, one $4\frac{1}{2}$ in. x $4\frac{1}{2}$ in., the other $4\frac{1}{2}$ in. x 9 in. The latter has exactly twice the stroke of the former, and in order to maintain a safe piston speed must be operated at exactly half the number

of revolutions per minute. If both motors have a compression of say 60 lbs., the former will have a compression space of $1\frac{1}{2}$ inches. This added to the stroke of $4\frac{1}{2}$ inches gives us a total volume of 95.424 cubic inches, and a piston displacement of 71.568 cubic inches. In the latter motor we will have a compression space of 3 inches, this added to the stroke of 9 inches gives us a total volume of 190.848 cubic inches, and a piston displacement of 143.136 cubic inches, so you see the long stroke motor uses and handles just twice the volume of gases and the short stroke will take in gas just twice as often. So it is, as stated, simply an even balance as to power produced and amount of fuel used with light weight of the motor and all other power transmitting and supporting members in favor of the short stroke motor.

What the public needs and is looking for, is to have the manufacturers set forth real facts in the form of mechanical reasons why their cars are of good construction, and the sooner it comes to this, the sooner will the purchasing of cars be placed on a sound and business-like basis and the sooner will the maker of a first-class product be justified in spending his money in advertising. As it stands to-day it is either a fact that the money spent in advertisements is wasted, or the fellow with the cheap construction that advertises in the loudest and most ridiculous manner is the one that is reaping the benefit. The quicker the maker of the good product gets busy by a series of intelligent advertisements to educate the public the sooner will he cause them to investigate and buy his product by reason of its greater worth.

(Note by the editor.—In relation to the foregoing, it may be stated that Mr. Pembroke writes purely because of his interest in the automobile, or *con amore*, as the classical might say. He has no personal interest whatever in the advertising of automobiles, and thus his opinions are free and unbiased; nor has he any opinion he will not willingly exchange for the truth. But we have found that with advertising, as with a good many other matters, it is easier to pull down than to build up; easier to state what should not be put into an advertisement than to state what should be put into one. Taking this into consideration, Mr. Pembroke's criticisms apply to the general run of all advertising, and not to automobile advertising alone. Yet it must be admitted that there is a good deal of effective automobile advertising, just as there is of other advertising.

But for the most part, advertisements are written by two classes—business men who are absorbed in other lines of thought and whose training and experience have been cast in other directions, and by the so-called experts, graduates of "advertising schools," who are often more concerned in exploiting their own expertness in the use of fine or picturesque phrases, than in stating simply, concisely and clearly the merits of the thing they wish to sell.)

In the three most common classes of cars the tire sizes have grown a little, excepting in the \$1,500 class, which shows a reduction. This has undoubtedly been brought about by the rivalry in this class in which every maker is trying to outdo the other in the amount of car he gives for the money.

The income to Massachusetts from motorists through fees and fines for the fiscal year of 1910 was \$386,547.78, an increase of \$228,357.78 over last year.

ENGINE EFFICIENCY.**It Depends Much Upon Valves and Valve Grinding.**

Much has already been printed in this magazine concerning valves and valve grinding, but new readers or those who are first having valve difficulties are asking for information, and with this in view, the following relating to the conditions which control the silence and efficiency of the engine may be read with interest.

The efficient and silent working of an engine is dependent to a great extent on the condition of its valves, and such attention as these require consists in the adjustment of their tappets and grinding in.

With regard to the first, it is always advisable to effect the adjustment when the car comes in from a run, for assuming that the engine is then in its warmest condition, it is obvious that no further expansion of the valves can take place, so that it is better to effect the adjustment after a run than when the engine is cold. The tappets should be adjusted so that only the slightest possible shake can be felt.

If it be suspected that one cylinder of four is very bad in regard to its compression, this can be tested by turning the engine over by hand with three compression taps open alternately. It may be found that the

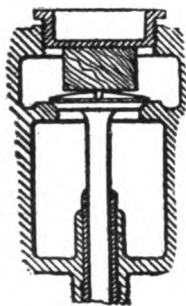


Fig. 1.

tappet of this cylinder is either adjusted too high, so as to prevent the valve from seating, or possibly some grit may be in evidence between the face of the tappet and the foot of the valve stem. When valve tappets are fitted with fibre washers, these washers sometimes become recessed, and occasionally the valve will fall to drop into the recess, but catch up on the side, and so be prevented from seating. In such a case the tappets should be removed and filed off flush with the fibre; or, better still, new fibre washers should be fitted.

Valve grinding is a somewhat laborious process, but it is one which often improves the running of the engine, so that it should be made a periodical performance. There are certain difficulties chiefly in regard to the removal of the valve, which can to a great extent be overcome by following the hints given below. When removing a valve spring, it is a great help to interpose, between the head of the valve and the valve cap, a block of wood, as shown in Fig. 1, which will prevent the valve being raised when the spring is lifted. If now the valve spring and cotter be raised, the valve cannot rise. Both hands are thus left free, and the process is greatly facilitated.

There are a number of tools on the market for compressing the valve springs, and it is well worth while to have one of these in the garage. Before actually purchasing, it is well to see that the tool in question will actuate the valve spring in the particular engine for which it is intended. All these devices appear to work, but when applied to some engines it is often

found that for some reason, which differs with every engine, one tool will not work, while another type will. For those who are handy at making tools, that shown in Fig. 2 can easily be made out of some metal strip. This tool has the advantage that it presses down on

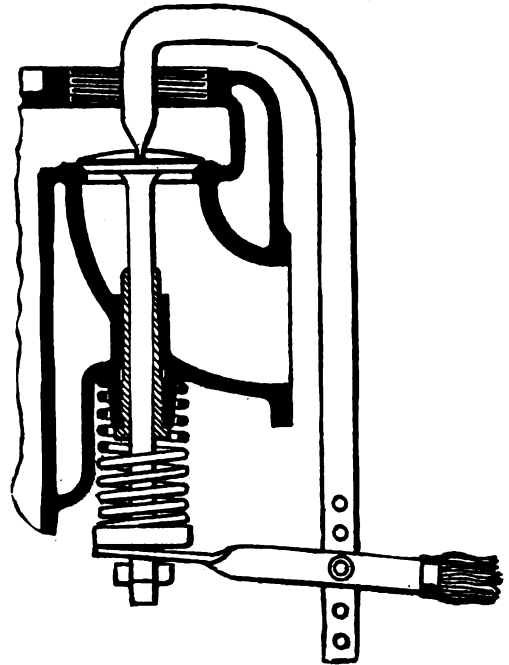


Fig. 2.

the top of the valve, preventing it rising and obviating the necessity for the distance piece shown in Fig. 1. This tool will not fit many engines, but is one of the best where it can be used.

After removing the valve, the cotter and spring should be removed and cleaned. A light spring should then be found which is just sufficiently strong to keep the valve off its seat, as shown in Fig. 3, and the tappet head should be slacked off so that there is no possibility of the valve stem bearing on the tappet. The tappet can be readjusted after grinding in the valve.

In the actual grinding in, it is best to use a special preparation for the purpose, although ordinary emery powder will suffice. This should be mixed with thin oil and applied to the valve face. The simplest way is to rub a little of the compound on the valve face, and

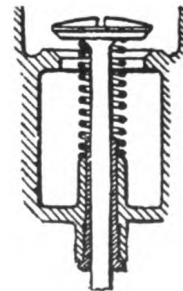


Fig. 3.

lubricate it well from an oil can. The valve should be turned either with a screwdriver or bracebit, but in either case the valve should not be rotated through a complete circle, but oscillated backwards and forwards, and from time to time the screwdriver should be removed, allowing the spring to lift the valve. This allows the emery and oil to mix up again on the valve face, and prevents a ball of emery collecting and running round in a circle so as to cut a groove. When the spring is not used, it is necessary to lift the valve

occasionally with the finger. The pressure applied should be slight, and it is advisable to use an excess of oil in preference to an excess of emery. An excess of the cutting compound merely causes clogging. The valve should be taken out from time to time and wiped to ascertain its condition, and it is finished when both the valve and the valve seating are perfectly clean and free from spots or pits.

The replacement of the valve is effected in a converse manner to its removal. If the particular type of valve tool so require, it may be advisable to use the distance piece as shown in Fig. 1. After the valve is replaced, the tappet head should be readjusted, and the engine run a few minutes to ascertain if the valve be in proper condition.

Why Two Cylinders Skipped.

E. Q. Williams, in *Gas Power*.—While on one of my periodical trips through the country lately, I stopped in a small village in the northern part of the State to see a customer; almost the first thing he said was "I wish you would look at my car, the coils are skipping so badly that I was just about to return them to the factory for repairs."

In answer to some questions he said that he had adjusted them in all sorts of ways and could not get even ignition any way he tried them; he said his timer was right and his mixture correct.

An examination of the coils showed 4 single box coils arranged in a row on the dashboard in a box of his own make; he was a general handy and repair man for miles around his own town and understood gas engines better than many others in the same business that I have met. The coils were wired correctly and adjusted fairly well, and after cleaning the contact points and making a slight change in the adjustment the motor was started and the trouble very quickly made its presence known. The battery tested all right so it was not there and careful adjustment did not seem to help much. Two of the cylinders would work beautifully but the other two would persist in skipping; that is, No. 1 and No. 4 skipped while No. 2 and No. 3 worked all right. This certainly looked like coil trouble, but the coils worked perfectly and trying the secondary leads to the plug so as to show a spark each time contact was made did not show any trouble. The timer was examined, also the wiring, but everything seemed to be in perfect condition, even to the skip, it kept on doing business right along.

Then a new set of plugs was tried out, but did not give any better results.

One of the first things I usually do in a case of this kind, is to change the coils, putting a coil that is working perfectly in the place of the one that is giving the trouble; but in this case the connections were made in such a way that it was quite a job to do it, so it was left until the other tests had been tried out; now however, this was done and as the trouble still remained in the same place, that is coil No. 2 which had worked perfectly on cylinder No. 2, skipping on No. 1 and coil No. 1 working perfectly on cylinder No. 2 showed very plainly that the trouble was not coil trouble.

I always make it a point to keep my fingers off from the carburetor until I am satisfied that there is no trouble elsewhere, but now this was carefully and slowly adjusted with the result that the trouble changed from cylinder No. 1 and No. 4 to No. 2 and No. 3 and they took their turn at skipping. I immediately noticed that the skipping could be changed

at will to either pair of cylinders and following this line up, noticed that the intake pipe came up from the carburetor in one pipe which immediately branched into two pipes; these in turn led to cross pipes one to each pair of cylinders, but they entered the cross pipes almost opposite the intake opening of cylinders No. 2 and No. 3, so that these two cylinders drew their gas almost directly from the carburetor, while in order to reach No. 1 and No. 4 the gas had to make another right angled turn, and setting the carburetor for one pair of cylinders would starve the other pair, or setting right for the second pair would flood the first ones.

I asked the owner if that was the pipe that came with the outfit. "No," said he, "I had to make a new one on account of some changes I made on the motor." As I had had this same trouble on another case which was only cured by a new intake pipe which allowed the cylinders to have an even chance, I quickly explained the matter to him and ran for my train, but before I left he said that he had been so firmly convinced that the trouble was in the coils that had he sent them in and the factory returned them as all right, that would have condemned them at once and put on others.

OLD CARS AND NEW.

The Second Hand Car, How It Is Often Used and Prices that Are Received for It.

Pausing in his work long enough to straighten up and reflect a bit, a Binghamton man in the automobile business took time to make the following remarks the other day:

"I don't believe that cars ever disappear entirely unless they're smashed or burned. They just keep on running, and if you seek in the right places you'll very likely find some of the very oldest makes still doing their work in a sort of way.

"It isn't always the man who is looking for something cheap who buys the second hand car," this man continued, "for instance, the other day a man came in here and said he'd like to have one of our used cars to drive at first so that if he happened to run into a telegraph pole or to meet with some accident the cost to him would not be so great. He was a man who had plenty of money and he wasn't mean either. He just didn't want to throw money away on a car to learn with. We sold him the used auto and we're just waiting now for him to come back to buy a new car.

"The big foreign car isn't so much in demand among the second hand dealers as it was once. In fact it isn't the big car that is wanted ordinarily. You see when you have a car that cost \$4,000 or so originally it sells at a great discount when it comes to be second hand. That is true of American and foreign makes too; but the small car which sells from about \$1,500 down doesn't lose so much relatively when it comes into the second hand market. Any car like that in fairly good condition will bring close to \$1,000, so it loses only a third, whereas a big car will lose perhaps two-thirds.

"One thing that regulates the price of second hand cars is the reputation of the makers for turning out consistently good cars. Let them have one bad year and it will take them long to overcome the effects of that. Nothing travels faster than the reputation of once having made a bad machine, and it may take two or three seasons to switch sentiment around the other way. That operates in the case of the output when it

has been used as well as when it is new, so the general effect is far reaching.

"Aside from the men who get hold of second hand cars to run them for pleasure, are those who make use of them in other ways. For instance, some men will remodel the cars so as to make light commercial vehicles. The power plant is utilized in that way, the body being remodeled. Light trucking, hauling baggage and delivering groceries or dry goods can be done adequately by such a car in a small place making an effect that couldn't be obtained by the expenditure, often very slight, in any other way.

"Then, too, folks who have ambitions for speed in boats put the automobile engine in some boat that originally had no motor power. The auto engine is likely to develop more speed in such a boat than is wanted, but it makes a power boat out of an ordinary craft and that is the desired result. There is farm machinery a plenty, too, being driven by motors that once were housed in automobiles. That is a very common use of the machinery of superannuated automobiles, especially in the middle West. There are so many uses made of old automobiles that it may be said they don't die, they merely transmigrate.

"The advertisements of city dealers in second hand cars are to be found in many papers and magazines that serve districts in the country. They do not appeal to the cities alone, and in fact it is not in the city that they find their steadiest demand. The big dealer in a city very often supplies a dealer in second hand automobiles in a smaller place, and at any event he depends a great deal on what he sells outside the particular city he is in. Men are coming in all the time from the smaller towns to look over the city dealer's stock, to order cars to be taken back and turned over again.

"There are conditions under which it is now unwise to order a second hand car; that is, when the factory which made the car has gone out of business. It comes down after a while to a case of having parts made to order, at very great expense, because they cannot be obtained from any factory. Not just on this same line, very often old cars are broken up to supply parts for other cars. Time and again a car that wouldn't bring \$200 as it stood complete is worth perhaps \$350 or \$400 as parts.

"The used car business is something that manufacturers are now paying attention to as a very necessary side of their regular trade. Of course the agencies are there to sell new cars, but there is plenty of demand for used cars too. Then again, there are the cars that are taken in trade. Time was when the agent figured what was the most he'd be likely to get for the second hand car—whether an old one of the make he was selling or another—perhaps added on a small amount, which came out of his commission, and put the proposition up to the prospective customer in that form. Then if the deal went through the car would be put out on the floor and an effort made to sell it just as it stood and take what loss or gain there might be. That isn't the way the thing is handled nowadays.

"Now, for instance, if a man takes in a used car of the make he deals in, instead of shoving it out on the floor without further attention of depending upon chance for the resale he has it put through the factory. All the parts that show wear are renewed and the car is furnished up and painted, until it looks like something. In many cases a guarantee goes with it. It is salable then at a good high figure, and it is duly advertised as much almost as the new product.

"A car of this sort can be sent out on the road and

the agent and the buyer too have a pretty definite assurance that the machine is good for some years yet. In some cases there are companies that actually are searching around for used cars which they can renovate and put out on the market, in order partly to satisfy the demand for cars of their make.

"Naturally all this care is not found when an agent takes in some other make in a deal. Then he advertises the car is to be sold as it is and no guarantee is given. When a car of some rival make is taken in trade the figure offered is not apt to be large, and as a result the price for which it is offered at sale is not great. This is one of the ways in which agents annoy one another. Making rather a feature of a rival car at a very small price is very apt indeed to stir up the wrath of the dealers in the other sort. There are reprisals too.

"However, there are agents who don't care to be bothered with carrying for any length of time second hand cars of any make. So what they do is this: A customer comes in and offers a car to be traded in. He wants to know what allowance will be made for it. The agent calls up some second hand dealer on the telephone and asks him what he will give for a car of the particular type in question. The dealer, if he knows well the man who is asking the question and has faith in the make named, gives his figure. Then the agent is in a position to go back to the customer and to state either that figure or perhaps one a little better, sacrificing a part of the commission, and the deal is carried through.

"Later on the second hand dealer comes along, pays down the sum he offered for the car, and it is taken away. On occasions a car like this will remain less than six hours in the possession of the agent who dickered for it. The second hand dealer appears to be buying a pig in a poke, but really he isn't taking chances because he doesn't proceed unless he knows with whom he is dealing and also approximately what sort of a car he is going to get.

"Buying a second hand car is taking a chance for the ordinary person unless he knows with whom he is dealing. In the case of the car made over by the factory itself he is reasonably sure that he is getting something that will stand up, but then again the price he has to pay is likely to be rather more than would be the case with a straight out and out second hand car. Indeed often those remade used cars bring astounding figures when the factory sells them.

"However the ordinary dealer won't give a guarantee of any sort. Some dealers, too, are apt to stop up cracks with putty and to cover up things with paint that may mean a lot to the running and life of the car. It takes an expert on engines, too, to tell the defects there may be in some, and the average buyer is a victim to be fleeced, in the minds of some second hand dealers. On the other side there are several of the most reputable type. They wouldn't think of selling a car that wasn't fit to run for a long time, even if they give no guarantees, and these have the hardest sort of struggle to live down the reputation that their less scrupulous brethren have given to the trade.

"One good rule is: 'If you're not an engineer and you have no guarantee of the honesty of the dealer better have help in picking out a second hand car.'"

When your automobile is at rest, occasionally glance beneath it while the engine is stopped and the gasoline turned on. This caution may prove profitable.

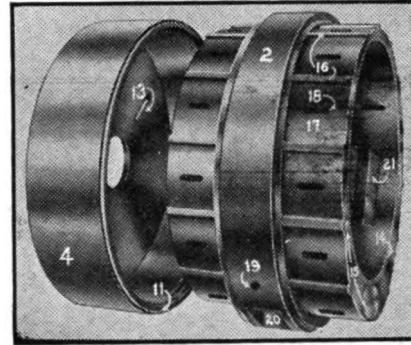
A NEW ROTARY ENGINE.

Said to Make Use of Expansive Force in Either Steam, Gasoline or Alcohol.

There has been invented and patented in the United States and foreign countries a rotary engine which is now successfully running in Buffalo. Very strong claims are made for it, but without the opportunity of making thorough tests and examinations, of course no one has a right to either endorse or doubt them. It is estimated that in the United States Patent Office alone, over 3,000 patents on rotary engines have been issued. Perhaps 10,000 applicants were refused patents on machines as being impractical. Hundreds of thousands of attempts were made by men who failed to apply for patents. Now, approximately, the same is true of every civilized country; and so it will be seen that the rotary idea in an engine has had uncountably more devotees than any other labor-saving proposition attempted by inventive genius.

This engine, which is called the Augustine rotary engine, is said to deliver power from impulse, expansion and leverage, and is so constructed as to utilize these at the extreme of advantage and economy. There is no loss from starting and stopping, as in the case of the reciprocating or slide valve engine; neither has it a dead center, nor any appreciable inertia within itself. It utilizes pressure at any point above the atmosphere, and in this respect differs from the reciprocating and turbine types, both of which have great initial loss. It obtains and delivers in the shape of power, so it is claimed, the limit of force and expansion of whatever element—vapor, heat or fluid—that may drive it, and consequently operates most economically. Finally, all its power is developed on leverage,

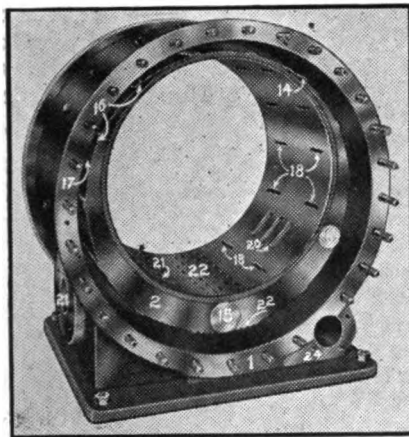
this engine—the mind of man could not travel beyond the laws of nature! A basic invention! No limit to the range of power units—the principle and construction as applicable to one thousand horsepower as to one horsepower! No skill required in the operator to control it! The three methods of power production combined into one cylindrical case—the reciprocating



2—The abutment, within which the rotor, core, or piston revolves and which serves the same purpose as a cylinder head.

principle of alternate impulse and expansion; the turbine principle of a floating core and terrific speed; the rotary principle of constant travel in one direction and power at all times delivered on the leverage principle with the impulse and expansion of the driving force—three things in one—the trinity of powers, controllable, but as illimitable as the darts of Jove—than this no inventor ever made a greater stride for the benefit of civilization!"

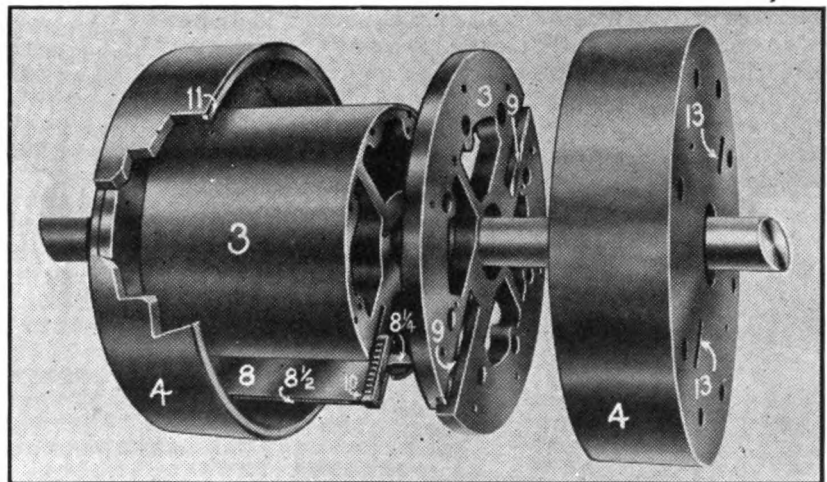
Among the varied uses that are claimed for the Augustine Rotary Engine is that of automobile propulsion for which it is said it needs only one-third of



1—Cylinder casing, in which abutment is inserted and bolted rigidly thereto.

which ensures the full potential of the power applied.

It is stated that this engine adapts to its use the two offsetting cardinal principles of the universe, centripetal force and centrifugal force, that it will operate with steam, gasoline or alcohol, that it is reversible at any speed, and that it is 33 per cent. more economical in the use of fuel than any other type of engine. Also, that it is reversible at any speed. And here are some glowing words concerning it which will be put within quotation marks, for the writer would hardly care to be so effusive: "Compact, indestructible, unwearable, having but three moving parts, none of them exposed to possible damage—as economical in the production of artificial power as was nature herself, there was nothing conceivable in invention beyond



3—Revolving core, also called piston or rotor.

4—Telescopic discs, forming a periphery balance, which are bolted to and become part of rotor 3. (The one to the left is partly cut away for better illustration).

fuel required by other types for same service or horsepower; any speed; no cranking; no inflated tires required, as travel-vibration does not affect it, and cannot jar the parts injuriously, and it has no vibration of its own; noiseless as an electric, and power may be placed on all four wheels.

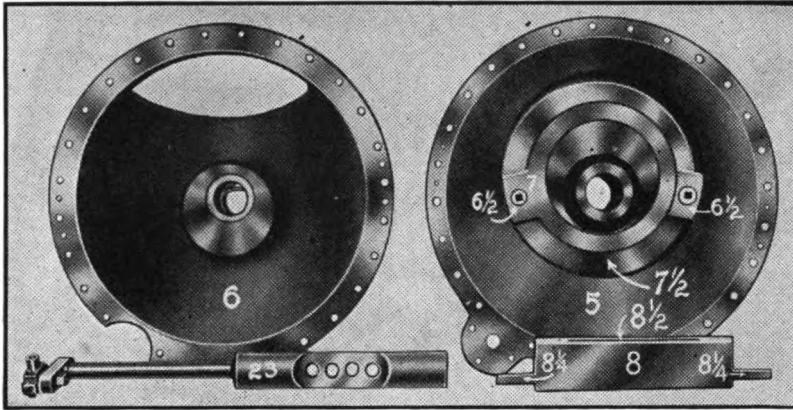
It may here be stated that if the foregoing claims are true, and we have no evidence that they are not, it should not be necessary to offer for sale any stock in the company owning this invention. The company should be able to sell engines for automobiles faster than it can sell stock. Of course, there are always doubting Didymuses, but one of these engines in use on an automobile, if as revolutionary as stated,

would be the means of their speedy adoption upon all cars, and no stock selling would be necessary; or rather there would be such a demand for stock that it could not be supplied. Possibly this may soon be the case. At all events, let us hope so.

This engine has an automatic cut-off balanced valve 23 which operates from a centrifugal governor 25.

The rotor 3 of the engine has two flanges, integral thereof, which flanges together with the rotor are slotted to receive the blades 8; on both ends of the

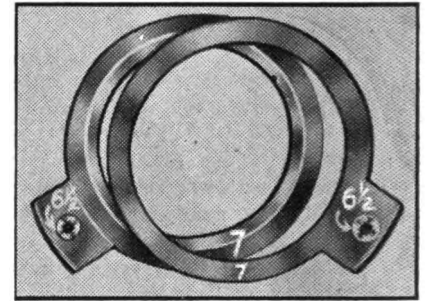
end to end of the rotor and entirely through the flanges and the arms $8\frac{1}{4}$ into compensating balance rings, fitted so that the pressure of the motive fluid seals them and creates a perfectly steam or vapor tight joint. Where the blades come in contact with the flanges and rotor, are provided roller-bearings 9 and 10, operating to prevent frictional loss or wear at these points. At both ends of the abutment 2 will also be seen packing rings 14 and packing blocks 15, which form running joints with the flanges on rotor 3, creating vapor-



5—Cylinder head, containing compensating balance rings 7, and bushing $6\frac{1}{2}$ to carry blade arms $8\frac{1}{4}$.
6—Ring bearing journals.
 $6\frac{1}{2}$ —Bushing, for blade arms.

rotor are rigidly bolted the telescopic discs 4 which then become part of and revolve with the rotor. Through these discs the blade arms $8\frac{1}{4}$ project into the bushings $6\frac{1}{2}$ and compensating balance rings 7. In the slots of the rotor the piston blades 8 operate, and counterbalance each other through action of compensating rings 7. The rotor carrying the blades operates in a perfectly circular chamber, and is mounted to run concentrically therein, running upon the bottom thereof and in contact with abutment 2. This abutment 2 is reduced at its outer circumference at both ends sufficiently to permit a running fit of the telescopic discs 4 over the ribs 16 of the rectangular-arc-balancing chambers 17.

In abutment 2, between inlet port 20 and exhaust

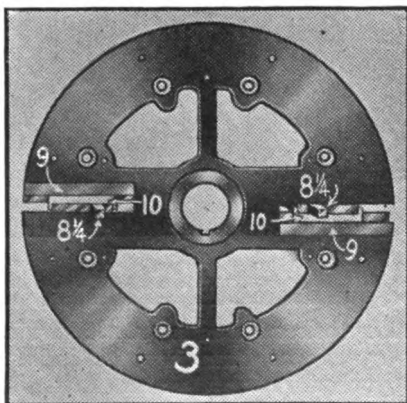


7—Compensating balance rings and blade carrying plugs.
 $7\frac{1}{2}$ —Channels in heads, in which compensating rings travel.
8—One of the piston blades.
 $8\frac{1}{4}$ —Blade arms.
 $8\frac{1}{2}$ —Shoe of piston blade.

tight joints. All possible leakage is prevented by the adoption of the simplest and most practical methods.

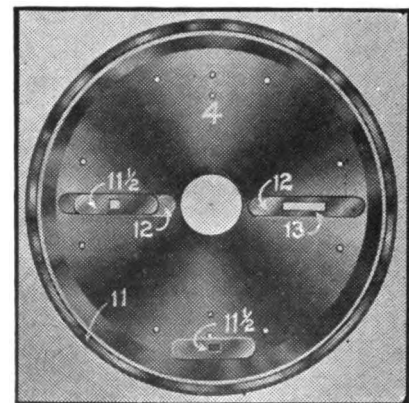
The perfect balancing of the piston blades 8 is an original feature of this engine. This is now effected through compensating rings 7. With these rings the action of centrifugal force is absolutely offset by counter-weighting one blade with the other; both blades always being in running contact with the cylinder wall, and without friction.

On the admission of steam or other impulse at port 20, which is controlled by automatic valve 23, and as the rotor 3 with piston blade 8 crosses the interior port 20, valve 23 oscillates, permitting the pressure to enter the cylinder, and this pressure instantly effects a perfect balance between rotor 3 and telescopic disc 4, by



9—Roller bearing track for blades.
10—Rollers and roller retainers.

port 21 there is formed a differential arc of a circle in which depression the rotor revolves according to its own lesser diameter and forms at that point a running joint. At the contact points of abutment 2 and rotor 3 and telescopic disc 4 are to be seen priming pockets 22, which seal the joints and lubricate the rotor 3 and telescopic disc 4. The piston blades 8 extend from

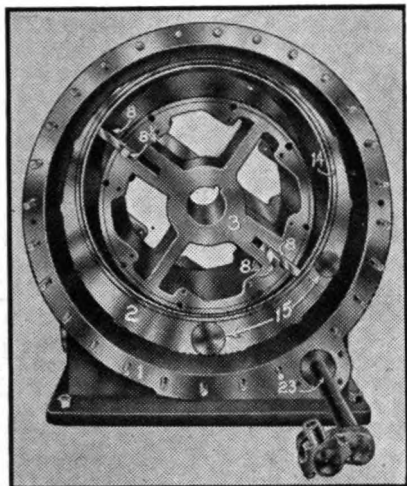


11—Cast-iron packing ring in telescopic disc 4, closes against edges of abutment, forming running joint.
 $11\frac{1}{2}$ —Valve plate, fits on $8\frac{1}{4}$, closes off opening 13, to make steam-locked chamber.
12—Channel to receive valve-plate $11\frac{1}{2}$.
13—Opening to allow blade arms $8\frac{1}{4}$ to pass through to compensating balance rings.

also entering the rectangular-arc-chamber 17 through port 18, preventing any side or end thrust against the shaft or cylinder walls. The pressure against blade 8 causes rotor 3 to revolve, and as it rotates the pressure becomes equalized through ports 18 progressive-

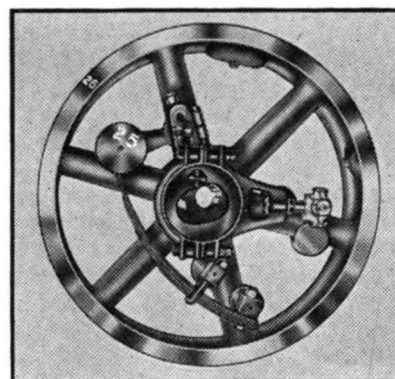
ly at all points of the entire revolution. As the valve oscillates, a cut-off of the motive force is effected, giving opportunity for expansion, and while expansion is taking place behind one blade the opposite blade comes

notice a crowd of observers gazing into a window, apparently most intent upon the lively rotations of a small cylindrical affair which sets upon four hollow legs resting upon the window ledge inside. A printed card states that "this is a 12 h.p. Augustine automatic



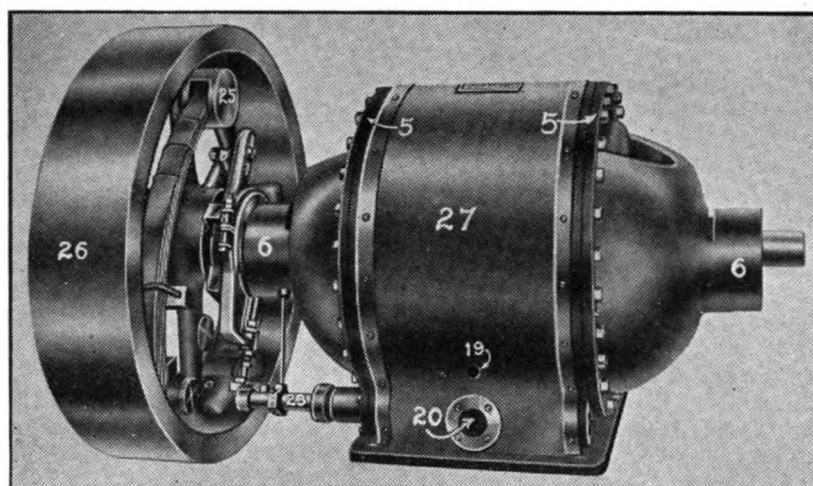
- 14—Cast-iron packing rings, in ends of abutments.
- 15—Cast-iron packing blocks to prevent back leakage.
- 16—Ribs of rectangular arc balancing chambers 17.
- 17—Inner wall of rectangular periphery balance chamber.
- 18—Ports for communication between revolving piston and rectangular-arc-periphery balance chambers.

into position and receives a fresh impulse from the motive force, the first charge is still expanding behind the first blade, until both blades extend equally from wall 3 of rotor, at which instant exhaust takes place and back pressure is avoided, exhaust port 21 being



- 19—By-pass port, to permit of starting with full load.
- 20—Main inlet to automatic valve.
- 21—Exhaust ports.
- 22—Priming and lubricating pockets in abutment 3, to form sealed running joint between revolving piston and inner and outer faces of abutment, and also between walls 3 and 4.
- 23—Valve.
- 24—Valve chamber.
- 25—Centrifugal governor.
- 26—Wheel to carry governor.

rotary engine, running 300 revolutions a minute, and driven by steam entering the engine through a pipe one-fourth of an inch in diameter." Mingling in the groups constantly changing before the window one may hear all kinds of expressions of amazement, interest, or doubt; for, beyond question, they are looking



27—Complete engine; 50 H. P.; base 22x24 inches; 36-inch flywheel; speed 400 R. P. M.

always open. It will be seen by this alternate action of impulse and subsequent expansion through the accuracy of our automatic cut-off governor, an even torque is effected, and by thus obtaining two impulses and two complete expansions to each revolution a perfect balance of the moving parts results, with practically no variation in speed during the varying of the load, and only the slightest variation between full load and no load.

This engine may be instantly started with a full load by simply opening by-pass 19, which is a direct port into the cylinder above the automatic valve.

Anyone passing along Washington street in Buffalo, in the block back of the Ellicott Square Building, may

upon something that many mechanics regard as the eighth wonder of the world—the concentration of power production into the smallest possible compass and with the fewest active moving parts ever put into a prime mover; an engine with no exposed or delicate mechanism.

When shifting gears, disengage the clutch quickly and shift the gears with a quick push or pull, and in the meantime close the throttle almost tight and allow the clutch to come back quickly as soon as the gears have been shifted. This method is used by many good drivers.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

Questions of Interest.

From Sandford E. Frazell, Nebraska.—I have been told that flash boilers soon become unfit for service on account of scale collecting in them. Is this a common occurrence or not?

Does the pitch of auto chains affect the easy running of a car, or in other words does a chain of short links run easier than one composed of long links or vice versa?

I would like to hear the opinion of the editor and of readers who know from experience or observation of the comparative merits, advantages and disadvantages of the following opposed kinds of cars and methods of construction: Steam cars vs. gasoline cars, chain vs. shaft drive, fire tube vs. flash and semi-flash boilers, solid vs. pneumatic tires, light vs. heavy cars, long vs. short wheelbase, gasoline vs. kerosene burners (for steam cars), high vs. low wheels, small vs. large road clearance, underslung cars vs. overslung cars.

I would also like to hear from the editor and readers as to what they have found to be the most satisfactory water level indicator.

Reply.—Many of the foregoing named subjects are good ones for discussion, although most of them have already been treated in one way or another in these columns. To cover them all properly would require the reading space of a single issue. We hope to hear from some of our readers concerning such of them as they may be specially interested in. Meantime, for the temporary needs of our reader we may say that flash boilers as made to-day are far more durable than formerly and they do not become frequently unfit for use; that an English authority says a chain can never be in true pitch with its sprocket, as wear at once throws it out, but it is generally considered that the most satisfactory results are obtained by the use of sprockets having 12 teeth or over and that there should be some play between the teeth and the chain roller; that on the whole, gasoline cars are to be preferred to steam cars; that there is less friction with chain than shaft drive, but that for other reasons shaft drive is preferred for most purposes; that in point of quick steam and other advantages steam cars designers prefer flash or semi-flash boilers to water tube boilers; that pneumatic tires are better than solid ones; that cars should be as light as possible and stand the strain and wear put upon them; that a long wheel base has more advantages in comparison than a short wheel base; that gasoline is the best fuel for steam cars; that fairly low wheels are better than the unusually high; that underslung cars have advantages over the overslung; that the water indicator of the Lane steam car, which is a dial indicator located on the dash and operated by an automatic pass, or by temperature changes which depend upon the height of the water in the boiler, is said to be satisfactory.

All the foregoing queries are interesting. We have simply given in the briefest words our own opinion.

There are readers of this journal who know more about some of these matters than the writer ever dares hope to.

Favors Clincher Rims.

From J. Harris Wight, Massachusetts.—Having driven several cars with the old style clincher rim, I can say after reading of many accidents, and two or three I know of near me, I can see where the old clincher rims are the best by far.

I can easily take a tire off and replace the same in a good deal less time than it can be done with the new Q. D. rims. Of course, an expert that has one ready can show up very well, but I have seen many on the road with hammer and chisel trying to put the rims back on, and in several cases I have helped them, which took from 15 minutes to one-half hour's time. While riding in one costly car, it took us 40 minutes to replace a tire. It was finally put on by a tire man who stopped and helped out.

I have run heavy cars for over eight years and I have never had a tire fly off yet and I can change them easily in a few minutes, any time. After seeing what I have of the Q. D. rims, I would never feel safe with one on my car. People do not stop to think of the heavy pressure inside a large tire, and if it lets go all at once, and one stands near, there is surely something going to happen. With the clincher rim, such things are impossible; nor have I ever read of anyone getting hurt with them, but the journals every little while, have accounts where some one is killed or hurt, by a Q. D. rim flying off. One here had an arm broken; another was hit in the head and the third was otherwise hurt by one.

There are lots of good improvements put on autos, but about fifty per cent. are not as good as the old ones were. It is simply trying to better what is good enough. Only last Sunday, in front of my house, a man spent about an hour with a Q. D. rim changing the tires three or four times and trying to get the rim back into place.

Auxiliary Engine Base.

From C. M. Stanley, New York.—In reference to the inquiry of F. R. B. of Michigan, about an auxiliary engine base for the model T. Ford, I have one of these bases on my car and would not be without it for several times the cost of it, if I could not get another. It would take a good machinist about four hours to put it on the car and then it puts you in shape so at the outside you can get at all the bearings of your engine and by removing the cylinder head, take out the pistons if you desire. I consider it a very desirable acquisition to the car.

There is also a timer for the Ford T, made by the Auto Parts Company of Providence, R. I., which I consider about as valuable as the auxiliary engine base. I at one time had a little trouble with my timer before I knew anything about the working of it and I was twenty-five miles from a good repair shop so had to study it out for myself.

Pilot Light Heating.

The note of inquiry from F. S. H. of Georgia in relation to the use of common illuminating gas burning a yellow flame to heat the pilot light was referred to the White Company, and their reply is as follows:

"From our experience we could not recommend common gas for heating the sub-burner, neither could we recommend the use of acetylene gas for this pur-

pose. We note what he has to say relative to the great display of flames in "firing up" his model "O-O" 1910 Steam Car, with the sub-burner furnished with the car, and we are at a loss to understand why he should experience any trouble of this sort unless the person firing up the car, allows the gasoline to flow too freely when flushing the sub-burner. It might be possible that the flush-valve of the sub-burner leaks some, which, of course, would allow a small amount of gasoline to flow continually and cause a display of fire from the burning of raw gasoline.

"The use of a Bunson burner or blow torch would be rather an antiquated method, as this was used in the olden days by the Locomobile Steam Car in Detroit, and the Stanley Steam Car. We believe if he uses the present sub-burner furnished with the car and keep it in order, he will not experience any difficulty."

Hooking Up Stanleys.

From Edwin L. Ide, Michigan.—In answer to W. B. P., Vermont, in the April number, will say that if there is no arrangement on the 1906-07 Stanley cars for hooking up the links, I would certainly change it so that I could cut off at $\frac{1}{4}$ stroke on the road. When in full gear the cut off takes place at about $\frac{3}{4}$ stroke, which is all right for starting, running very slowly or climbing steep hills. But to get the benefit of using steam expansively $\frac{1}{4}$ stroke is as nearly correct as is possible with a slide valve. I beg also to differ with J. Harris Wight, Massachusetts, that there is a difference in effect whether the engine is large or small, as the effect is identical in both cases.

In regard to purchasing second hand cars, my experience has been that the second hand steamer is by far the best proposition; in fact I think the steamer is the best proposition whether old or new, as there is less trouble, less cost of upkeep, nearly double the power, weight for weight, and it is easier to understand and manage.

Steam Car Boilers.

From F. H. Rudd, California.—I have owned and operated four different steam traction engines, ranging from 10 to 16 h.p. and found that to get that amount of power out of them that the boilers must evaporate from 12 to 18 barrels of water per day threshing. The question with me is, how such small machines as the steam automobiles are can furnish the power they claim for them with so small an amount of water evaporated. I hope some one will give a logical answer.

Reply.—Although we don't know much about steam tractors if they use the amount of water our friend states, they are the simple type of engine, while the steam automobile engines are compound. Their boilers are of small dimensions, are tubular or shell, they have flash or semi-flash generators, super-heated steam, and the water is used over and over again. This, in brief, seems to be the case, but if we are not clear and correct some of our better posted readers will kindly explain more fully.

The Whistling Stanley.

From A. N. Henshaw, Plattsburg, New York.—If you care to do so, kindly forward this to W. B. P., whose inquiry appears on page 71 of the April issue. Whistling does not indicate that there is anything wrong with the burner, but is an indication that it is clear and burning well. Many burners whistle under certain conditions, but a little experimenting will

probably do away with the whistling under ordinary road conditions. If the air pressure on the gasoline pressure tanks is raised or lowered a little, or the mixing-tube pulled out or pushed in a trifle—not enough to interfere with the fire—or possibly if the boiler pressure is raised or lowered by changing the adjustment of the fire-automatic, any of these little readjustments may do away with the whistling. It is at any rate worth trying.

Setting the automatic needle at just the right point is a rather delicate matter for one who is not used to work of this kind. If the movement of the needle is too great, the diaphragm is short-lived. I do not know how far W. B. P. is from Burlington, Vt., but perhaps the easiest solution of his difficulty would be to send his automatic to the Burlington Machine & Repair Company, 106 Church street. These people have done repair work on Stanley cars for years, and understand what they are doing.

To Keep the Spindle Clear.

To prevent the rusting or sticking of the spindle in the old style Stanley water-indicator, keep a small oil can filled with kerosene and put a little every day around the place where the spindle comes out of the indicator. This is best done when the boiler is syphoning, after steam has been blown off, as the kerosene is then drawn in where it is needed. Oil has a tendency to gum and make the spindle stick, while kerosene keeps it free. Drop some kerosene in the same place, after removing the indicator when laying up the car for the winter. This prevents rust, and may save the trouble of taking the indicator apart in the spring for the insertion of a new spindle.

A little oil will make the rings used in packing the Stanley power gasoline pump go into place much more easily than they will if crowded in dry.

For pasting asbestos paper to the smoke bonnet and steam pipes, try laundry starch instead of flour paste, as starch holds better than paste.

Care should be taken how a wrench or hard packing tools are used around the engine, as a scratch on the piston or valve-rods allows steam to leak past and quickly wears out the packing. For this reason copper packing tools are to be preferred to steel. With a hammer and file, it is easy to make a set out of heavy copper wire.

Ten minutes running the engine with one wheel jacked up will wear the differentials more than two months ordinary running on the road. It is best, if possible, to use two jacks, and raise both wheels from the ground, when for any reason it is necessary to run the engine light.

After taking off the differential case, be sure, in replacing it, that it is screwed on tight. Otherwise it may fall off and be lost when the car is on the road.

The steam gauge may be ruined if water is allowed to freeze in it. It is a simple matter to remove it when the car is laid up for the winter.

A Steam Locomobile in Trouble.

From W. E. Thornton, Iowa.—Where can I get repairs for a steam Locomobile runabout?

I have trouble with this second hand car. I have a pressure of 60 pounds in both air tanks. I run the steam up to 250 pounds and when I open the throttle it drops to 125. When I run the car 50 yards the steam drops to zero. The boiler is a coil of pipes. The packing blows out of the throttle and the rest of the places where it is used. The car is in fine shape all but the things mentioned.

PAINT SHOP PRACTICE.

Preparing for and Applying the Finishing Coat of Varnish Described in Detail.

From M. C. Hillick, Pennsylvania.—There is a great difference in the appearance of the same make of varnish upon different surfaces. It is all due, granting shop conditions to be practically the same, to the way it is put on the surface. On the wide, long sweep of the automobile surface it is the easiest thing in the world to brush varnish to death, or, at any rate, to brush it until the high, sharp brilliancy characteristic of varnish—that is to say, good varnish—is lost entirely. Having brought the surface up rich and fine with successive coats of rubbing varnish, and rubbed it down to a uniform level, the next step, and, in a sense, the most important step of all, is to clean the surface and dust it free from the minute particles and flocculent atoms adhering to it. The ways of doing this are fairly as numerous as the finishers engaged in doing it, but the writer's practice will perhaps suffice as well as any and if carefully adhered to will bring good results.

First wash the surface with clean water, using same from a galvanized iron pail and employing a soft wool sponge to distribute the water. Use plenty of water and a small wash brush to "tool" out around moldings, bracket work, etc. Use a clean supply of water for the second washing and make sure of getting everything clean. Especially be sure to get all particles of pumice stone flour off the surface and from under and around the moldings, from which points, unless so removed, it will be dislodged by the varnish brush and streaked over the surface. In drying off the surface use a soft, lint free wash leather, and instead of rubbing the surface hard with this leather pass it lightly over the surface catching up the moisture and leaving the mist to dissipate into the air.

This leaves a better surface to finish upon. Next dust off the work with a bristle dust brush, either flat or oval, and if any parts of the surface, particularly around moldings, where sharp edges are usually found, if anywhere, touch them over lightly with the body color, using the color sparingly.

Having this work attended to carefully wipe the surface with a piece of silk—a clean silk handkerchief will answer the purpose capably. For the final dusting use a brush specially reserved for the work and over the tips of the bristles flick a bare mist of finishing varnish. This will serve to lick up any loose bits of dust that may have escaped the duster and the silk.

Next, without further manipulation, proceed to lay on the coat of finishing varnish. Rather than brush the varnish on flow it on. In other words, put on a heavier coat of varnish than could be put on by simply brushing the varnish on with the brush held at an acute angle, by which method the points of the bristles overwork the varnish and prevent it from massing into shape and developing its full body of brilliancy. Hold the brush at only a slight angle in which position the varnish will rather flow from it instead of being brushed from it. Suit the brush to the surface, using a three-inch brush for the largest panels and a two or a two-and-a-half brush for the medium sized surfaces. The amount of surface space that can be flowed before cross-brushing and shaping up will depend upon both the brush and the varnish. A highly elastic, slow setting up varnish used with a three-inch brush can easily be worked over the largest panel before cross-brushing and finally laying off.

In varnishing use a one-inch soft badger hair brush

to run around the outside of the panel after which operation fill in with the larger brush. Lay the varnish off horizontally and cross-brush at right angles then laying off to finish with the horizontal stroke, carrying the brush out sure and quick the full length or breadth of the surface. It takes practice, and experience, and study, to become a high-class finisher but the field is open to all. To skill add the best tools and the best varnish.

Wheels Out of True.

Some difficulty is experienced occasionally by the wood spoke automobile wheels going out of true, either circumferentially or laterally, or both. When a wheel is noticed to be affected, it should be attended to immediately, otherwise, it is quite possible that it may be followed by an entire collapse. Retruing is a thing which cannot be attempted by the ordinary repairer, and must only be put into the hands of a competent carriage builder who makes his own wheels or who can get them trued up by a firm which makes a specialty of wheel building. This going out of true is caused chiefly by the wheels being built up with imperfectly-seasoned timber, which is greatly affected by atmospheric changes, causing fluctuations in the tension upon the wheel. This will expand in wet weather, while in dry season it contracts and tends to split apart at the felloe and at the junction of the spokes with that part, despite the fact that the whole is bound by the iron rim of the tire.

A Handy Light.

A man who has a car which does not boast any lights on the dash gets occasional fits of worrying over whether the oil is dripping properly at night, when he can't tell unless he stops the car under a light and races the motor. Recently some one made him a present of a tiny hand pocket electric lamp, no larger than a match safe, and this has solved the problem for him. He simply leans over and presses the button when he wants to see what's going on. It does to light up the speedometer face, too. Lights on the dashboard are just another convenience of the many that the automobilist has now. In a thoroughly equipped car there are so many things designed for the convenience of the owner that most of his worries have been taken away.

Don't Hurry the Painters.

The quicker paint is put on, the quicker it will come off; therefore, if you want a new car, or an old one resuscitated, to look shabby before its time, just sit on the doorstep of the paintshop and hurry up the painters.

A Slipping Friction Drive.

From E. R. H., Vermont.—What can any one use on a friction drive to stop it from slipping when the filler gets glazed?

If the exhaust pipes are dirty or filled with soot it will cause back pressure and overheating of the engine. Opening the muffler cut-out gives temporary relief, but a thorough cleaning out of the foreign matter is the only permanent remedy.

See that cotter pins are in their places; if they are rubbed with flake graphite they will not rust and can be easily removed.

SHOCK ABSORBERS.

Address of E. V. Hartford Before The Association of Automobile Engineers.

Shock absorbers were unknown prior to 1900. In that year I returned from France from a protracted visit, and the automobile industry was still in its infancy, but considerably further advanced in France than in this country. With Mr. Truffault I had gone into this subject extensively, realizing how essential some restraining device was to the springs of the car as they were then constructed. Mr. Truffault had applied the basic principle of the shock absorber to the front fork of a motor cycle. His idea as to its application to a motor car involved great complications and made a radical change in the suspension of a motor car. I looked at the matter more broadly and was responsible for the three point friction device as it is used on the majority of automobiles today.

Mr. Truffault applied it to a spring fork of a motor cycle, and I made it feasible for the automobile. About the year 1900 we applied the first set of shock absorbers to a small runabout.

While I convinced myself and my friends of the absolute necessity of our device, the manufacturers were too much engrossed in building an engine that would enable a man to spend more time in his car than under it, to be diverted long enough to take up the question of improving the riding qualities. In those early days a man was lucky if he could keep his car going at all and if he got home without difficulty he considered himself fortunate no matter to what physical discomforts he had been exposed.

Springs of motor cars which were primarily intended for at least comparative high rates of speed involve conditions not found in horse-drawn vehicles or railroad cars, although the general construction of the spring is practically the same. Therefore, while conditions as far as the vehicle is concerned are widely different, but little change has been made in the springs. Railroad cars travel at high speed but they run upon an even and comparatively unresistant roadway. Horse-drawn vehicles although built for the ordinary highways over which the automobile must travel are rarely calculated for more than moderate rates of speed. Railroad trains must therefore contend against a maximum speed over a minimum road roughness; while horse-drawn vehicles on the other hand have only to provide against a maximum roughness with a minimum speed. When we come to the automobile we have to provide for a maximum speed as well as a maximum road roughness.

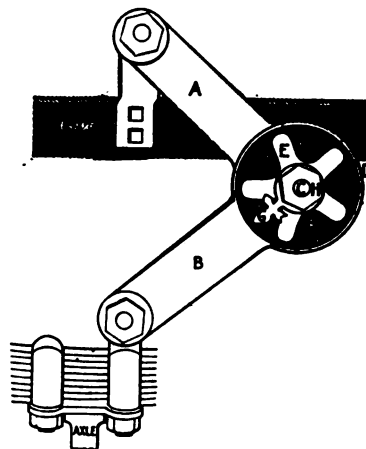
To be thoroughly serviceable a spring should possess two essential qualities in due proportion—resistance and resilience. That is, a spring should move from its idle point very quickly, and should be so constructed that under unusual stress and strain heavier and stronger portions of the springs should be brought into play.

When we first began to apply shock absorbers to automobile springs, we found a great many springs that were so stiff and heavy that the shock absorber was practically useless as applied to them, but gradually the spring makers have increased the flexibility of the springs until now there are several manufacturers that are turning out cars with springs of extreme flexibility combined with shock absorbers which are giving almost ideal results.

Speaking broadly, to obtain an extremely flexible spring it should be built of a large number of thin

leaves, say twice the number that is in the ordinary spring. The top leaf should be of the ordinary thickness as this has to carry the bearing which attaches it to the shackle or frame. By making three or four of the lower leaves a little heavier and placing them at a different angle, they will be brought into play under the stress of a heavier load and rougher roads. A spring so constructed would be practically useless on an automobile to be driven at high speed without the use of shock absorbers, but this is just the point that I want to emphasize here, that shock absorbers permit the use of a very flexible spring.

If the automobile manufacturers would equip their cars with springs such as I have described above, and would depend on the shock absorber to control them, we would get riding qualities in cars that have hardly been dreamed of up to the present time. The trouble is the manufacturers build the springs to be used without shock absorbers, and they would argue that if they built such a spring as I have described that it would not last on a car a mile over a very rough road, because its extreme flexibility would



Briefly described, the Truffault-Hartford Shock Absorber consists of a single arm, A, and a double arm, B, frictionally joined by the bolt, C, and adjusting nut, H. An adjustment dial, F, and indicator, G, provide a means of securing the correct tension for the car. A spider compensating spring, E, takes up any little wear automatically, keeping the friction uniform after the adjustment has been made. The arms, A and B, are joined to the frame and axle by two frictional joints, which also can be regulated. All these movable frictional parts offer a constant resistance to the vibration of the spring both ways, and it is easy to see that when the wheel strikes an obstruction the arms come together, but instead of flying back, as does the free spring, it is retarded by the friction and moves gradually to its normal position, since the friction is always the same, while the tension of the spring diminishes as it approaches its normal position.

allow the car to carry the top leaf far past its normal limit and to the breaking point. It is one of the offices of the shock absorber to keep the spring, no matter how great its flexibility within its normal working limits, and as long as the shock absorber is working, it is practically impossible to break a spring.

Some critics who are antagonistic to shock absorbers have argued that they stiffen the springs. I will give you an illustration and you can judge for yourself as to how much this stiffening amounts to, and how little increased flexibility in building the spring would be necessary to compensate for this.

Say the suspended portion of a car weighs 4000 pounds, put 1000 pounds of passengers in this car, and we have each spring supporting a weight of approximately 1250 pounds. The friction on the shock absorber measured at its points of attachment to the axle and the frame, the same points of attachment as the spring itself, is only about 30 pounds, which is all that is necessary to control this spring. This is only a trifle over 2 per cent of the carrying load of the

spring, and I am sure that this will be a great surprise even to those antagonistic critics.

Many copies of the original invention that have come upon the market have missed the real idea of the shock absorber entirely, and as a rule are not really as good as a rubber bumper and a strap, for they limit the play of the spring, and to obtain easy riding qualities over the roughest roads great play of the spring is necessary.

If some of you have ridden in cars that have been extremely easy riding, if you will examine the same again you will find that they have a spring play of at least ten or twelve inches. As a matter of fact, in theory if we made the spring play say six feet we could come pretty close to riding across country taking ditches and stone walls. A little experiment which I will describe to you will probably convince you of the reason why I claim that some of these competitors have entirely missed the idea of the shock absorber.

Put a long flat piece of steel in a vice and hold one end of it firmly: compress this steel and let it go. It will vibrate hundreds of times until it comes finally to rest. Press some smooth object such as a wooden hammer handle lightly against one edge of this piece of steel, and it will come instantly to rest, and the piece of steel is transformed from a vibratory instrument into a perfect cushion. This is the real secret of the shock absorber in a nutshell, and if you seriously think this problem out for yourselves after making this experiment, I do not see how you can come to the conclusion that any spring could possibly be devised which could do the same wonderful work as the flexible steel spring combined with the constant friction shock absorber.

Rough roads are inevitable and even when roads are fairly smooth there is a constant spring movement caused by the ordinary crosswalks, car tracks or other obstacles. Crossing these the car pounds down on the axle, acting like a tremendous hammer coming down as far as the four springs will permit; then comes the rebound and the springs are taxed to their limit in the other direction, and therefore while traveling over rough roads the springs are constantly contracted and expanded, not slowly and harmlessly, but violently, causing considerable discomfort to say nothing of the wear and tear on the parts. Of course, one may bring the car to almost a halt, but the lack of the necessity of constant braking, which is always a strain on the car and when constantly and violently performed produces great wear on the tires. Not only does the shock absorber save this by reducing the necessity of braking to a minimum but when traveling over rough roads at a fair speed with uncontrolled springs the car frequently leaves the ground—sometimes in front and sometimes in back, and a very prominent manufacturer recently advertised his car going at high speed over an inequality in the road where the four wheels were off the ground at the same time.

I believe it is a matter of record with you gentlemen, that a very large proportion of all the car troubles, are caused from the wear and tear which shortens the life of a car and this wear and tear is due to excessive vibration caused by the character of the roads and by unrestrained spring action. The racking to which an automobile is subjected in traveling over the ordinary high roads will jar loose in a very short time every nut and bolt in its entire make-up, providing the springs are allowed to go uncontrolled, but if properly controlled in such a manner as to prevent their violent expansion and contraction, there is no ex-

cessive oscillation and their efficiency is not in any way impaired. This reduces the racking of the car to a minimum. There is less wear and tear; less bouncing of the wheels, thus prolonging the life of the tires. We think the tire manufacturers concede that it isn't the wear that makes the tire up-keep so expensive, but it is the tear, or in other words, abuse. In addition to all these a car is capable of greater speed and there is always smooth running, irrespective of the condition of the roads. The construction of the Truffault-Hartford is such that racking, swaying, jolting, jarring and vibration are eliminated and comfortable motoring is assured. There is no lost power and every atom is conserved with the attainment of greater and smoother running made possible with a material decrease in the cost of the up-keep.

Compression Losses.

"Real pleasure in motoring lies in having a responsive motor with plenty of power," says William H. Stewart, Jr., of the New York Stewart Automobile School. "An experienced driver cannot enjoy riding behind an irregular machine. The untrained ear cannot detect these irregularities and quite often the motor is forced to do its work under abnormal conditions. Many efficient cars have been condemned simply because the power plant needed a little tuning up previous to a trip. Any one of a dozen small things may happen that will spoil the pleasure of a day if not cause serious damage to the whole mechanism of the car.

"It is not uncommon for a motor to lose its compression over night. While this loss of compression is not a difficult matter to remedy it nevertheless is the basis of most engine troubles and most certainly determines the efficiency of the motor. The compression of each cylinder may be tested as follows: If a four-cylinder type, release compression on cylinders Nos. 2, 3 and 4, and try compression on No. 1 by cranking. If good, then open Nos. 1, 3 and 4 and try No. 2. Likewise test the others. In this manner the faulty cylinder may be located.

"If the compression in any cylinder should be weak then the leak must be traced. Quite often it may be a loose valve cap or a faulty spark plug. It may be the compression cock. A leak about the external joints will readily be noticed when oil is placed on them and the motor cranked. If all are found to be tight then the compression leak must be internal, probably the valves. If the two valves, namely, the intake valve and the exhaust valve, become foul from the passing of burnt gases and carbon, a small piece of carbon will unseat the exhaust valve and cause the loss of compression. With a little emery and oil and slight grinding the valve may easily be resealed.

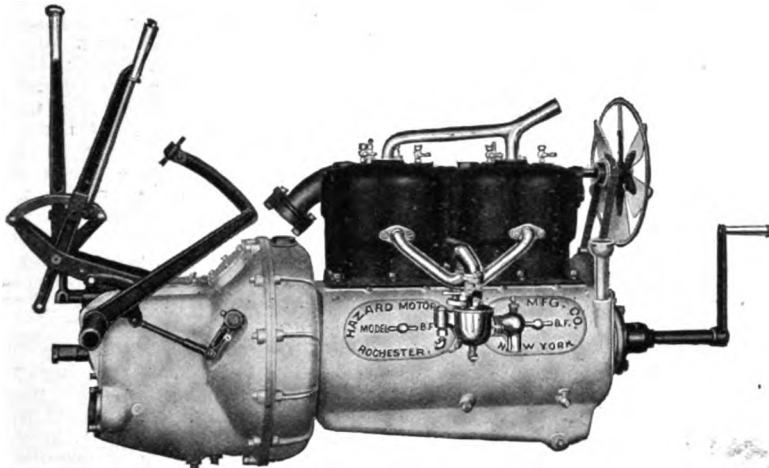
"Carbon deposit on the exhaust valve seat is a common trouble, but not the only one that causes loss of compression. A warped valve stem, especially in motors inclined to overheat, is very common. In such instances it is best to replace the valve with a new one. Then again the valve adjustment at the base of the valve stem proper should be noted. There is a certain clearance at this point to allow for the expansion of the valve stem when heated. At this point there should always be a clearance approximately the thickness of a calling card when the valve is seated."

Cheap oil and grease, together with its none too frequent application, do more to depreciate the value of the car than actual service.

The Hazard Unit Power Plant.

We illustrate herewith the Center Control Three-Point-Suspension Automobile Motor, which is manufactured by the Hazard Motor Manufacturing Company, Scherer street, Rochester, N. Y. This is described as an ideal motor to replace any worn-out automobile engine. The manufacturers state that this motor is oil-tight, dirt-proof, very powerful and thoroughly reliable. The motor may easily be placed in almost any car

company, are of genuine heavy cow-hide leather for the outside. They are lined with best quality of black canvas. Straps for holding tools also are of leather. Cases are marked on outside in large gilt letters with makers' name and number of sets. This company started about one year ago furnishing sets in leather rolls and have received a very large demand for them from garage owners, repairmen and auto owners. The manufacturers also make



Hazard Unit Power Plant. An Excellent Four-cylinder Automobile Motor. Made by the Hazard Motor Mfg. Co., Rochester, N. Y.

and is made in two sizes, 24 and 30 h.p., both of these motors having four cylinders.

It is impossible, within the limits of this article to describe all the good points of the Hazard motor, but if you are thinking of putting a new motor into your car you are earnestly requested to write for prices and full particulars to the Hazard Motor Manufacturing Company, Rochester, N. Y., and in doing so, please mention The Automobile Dealer and Repairer.

Automobile Screw Plates.

The Wiley & Russell Manufacturing Company, Greenfield, Mass., who are the originators of sets for automobile re-

a complete line of screw plates for bolts and pipe, machinists' hand taps, reamers, etc., catalogues and special circulars of which will be furnished on application. Send especially for new booklet F.

To Repair Men and Dealers.—In this issue will be found the announcement of the Electric Service Bearing Manufacturing Company of Milford, Ohio, giving particulars of their "Uncle Sam Copper Hammer." This hammer they say is properly shaped, having the qualities suited to the many uses which every repair man has for a copper hammer. They guarantee it not to rip or break from any reasonable blow used either as a hammer or buffer. This hammer is so tough that it can be hammered out of shape and back again into shape if necessary. Every repair man understands or ought to understand the value of a copper hammer in making repairs as compared with the ordinary steel hammer. Further particulars can be obtained from the advertisement of the company on another page, or by writing direct to the company.

Overland Tires.—The most of our readers no doubt will be interested in the advertisement of the Overland Tire Company, Department "M," 1409 Michigan avenue, Chicago, Ill. It is claimed that these tires possess what is called "Reserve Strength." They are built for wear and tear and are reinforced where needed to overcome side friction when running in dried mud-ruts. For further particulars and prices write direct to the Overland people.

"Broadway Reliners."—These are made by the Lake Erie Rubber Company, P. O. Box 54, Erie, Pa. See their announcement with illustration in our advertising department. "Broadway Reliners" (which are of a heavy type) are recommended by this company for old or weak auto casings. These reliners cost a little more, but are said to be correspondingly better. But consult the advertisement with prices.

Machine Tools and Special Machine Work.—We wish to call the special attention of our readers to the new advertisement which appears in this issue from the Garvin Machine Company, 141 Varick street, New York City. This company has a large new catalogue of garage machine tools, including a list of over eighty piston patterns, which they would like to place in the hands of our readers. This catalogue is free, if you mention this publication. The Garvin Machine Company makes a specialty of reboring and regrinding cylinders, furnishing new piston rings, etc., for automobile motors. They invite correspondence.

An Oil Proof Plug.—A spark plug that is oil proof has been a long-felt want. "Best" spark plugs are especially designed to overcome this trouble and are well adapted to give relief from this cause. The central electrode terminates in a button head condenser which is surrounded by an annular electrode. This central electrode acts as a baffler and retains a certain amount of heat; any oil that is thrown on it is dried up and the sparking surfaces are always dry and ready for action. This button head terminal protects the insulator from heat and shock of the explosion. The arrangement of the electrodes form a closed end, and produce, in a high tension ignition system, a spark that approaches, as near as possible, an arc



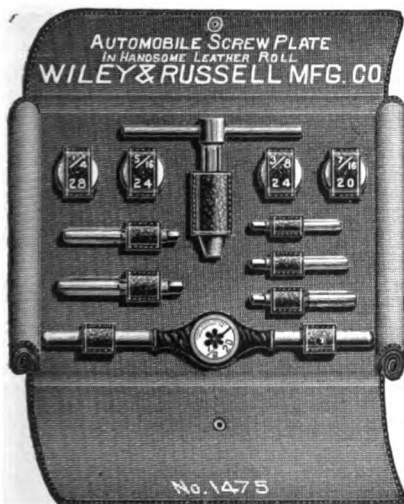
An Oil Proof Spark Plug.

flame that is secured by the make and brake ignition system, and by reason of this arc spark more gas is heated by the initial ignition and the combustion is much more rapid and complete. This rapid combustion results in more power from the motor. A compensating device that takes up automatically the difference in expansion and contraction between the electrode and the insulator



Button Head Condenser.

and prevents the porcelain from breaking; by changes in temperature, is another valuable feature. "Best" plugs are highly finished and are built of substantial generous proportions and are adaptable to motorcycles, touring cars, motor trucks, taxi-cabs, motor boats and aeroplanes. Manufactured by the Best Ignition Equipment Company, of 200 West 64th street, New York. See advertisement in this publication.



pairing put up in LEATHER ROLLS, are now placing on the market a new set. (See cut.) This is their set No. 1475. It contains stock, adjustable T tap wrench and taps and dies A. L. A. M. Standard 1/4-28, 5-16-24, 3/8-24, 7-16-20, and 1/2-20, all put up in genuine leather case. These leather cases, as well as all other leather cases furnished by this

The Rhoades Unit Spark System.

This is a new ignition device operated by battery, and manufactured by the New York Coil Company. Its purpose is to provide a perfect jump spark system operated by battery that will deliver a very hot igniting spark perfectly timed and of unvarying intensity entirely independent of engine speed. This system consists of two separate parts: the patent circuit operating mechanism, which determines time the spark is to be produced, the distributor which forms a part of this same instrument for the purpose of distributing a high tension current to the proper cylinders and special built non-vibrating coil, more properly termed transformer, which can be placed in any convenient position on the car, but is usually placed on the dash, as we provide a simple button on same which will start the engine on the spark, providing there is the proper mixture in the cylinders.

It will thus be seen that the timer, vibrating coil, complicated wiring, as

"Fix" Tire.—The Motor Accessories Makers, Inc., 84 Jackson Boulevard, Chicago, Ill., have a full-page in this issue descriptive of their "Fix" Tire, which they say is "as simple as A B C." It will mend your tires and cure crippled casings and tubes. They say further that you can get far more mileage out of your tires by the judicious use of "Fix" Tire than would otherwise be the case. They have a special proposition to make to dealers, and would like every dealer who is a reader of The Automobile Dealer and Repairer to write for this proposition at once. But consult their announcement, where full particulars are given.

Free to Every Car Owner.—The New York and New Jersey Lubricant Company, 165 Broadway, N. Y., have prepared a chart for steering clear of motor troubles, which shows just where and how the automobile should be lubricated. They will send a copy of this valuable chart free to every motorist who will fill out the coupon attached to their

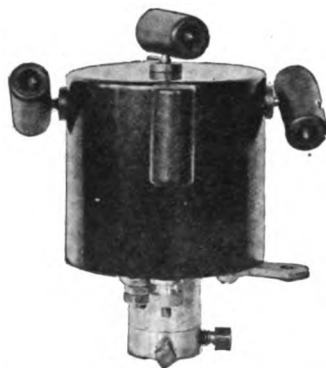
advise prompt action as the offer, if we understand it correctly, is only for introduction purposes. In addressing the Royal Equipment Company, please mention The Automobile Dealer and Repairer.

An Important Line of Garage Tools.—In an attractive announcement in our advertising columns this month we illustrate a line of special tools manufactured for garage use by the Stow Manufacturing Company of Binghamton, N. Y., the inventors and manufacturers of the celebrated "Stow" Flexible Shaft. This company manufactures an electric hand buffer which is very useful in a garage, for polishing the metal parts of an automobile. They also manufacture a portable "scratch brush," for cleaning rubber tires before vulcanizing. These tools, by means of a flexible shaft, can be used in any position, which makes them very handy, but readers should consult the advertisement and write for circular and prices to the Stow Manufacturing Company, Binghamton, N. Y., not forgetting to mention this publication.

The Twitchell Air Gauge Patent Valid.—The adoption and use of the Twitchell Air Gauge in the past two years has proven of great worth to pneumatic tire users, as they have been enabled to accurately determine their air pressure. Because of their popularity it naturally invited infringers. Realizing the validity and originality of the Twitchell Air Gauge patent suits were brought against infringers to adjudicate the Twitchell patents. These suits have been won, a decision having been handed down in the United States Circuit Court establishing the validity of the Twitchell patents and restraining infringers. The new gauge retains its original shape and size, but offers an improvement by having a stop feature incorporated in the gauge. This the public will undoubtedly appreciate. The legal establishment of the patent will undoubtedly create an increased demand for this standard article. The Twitchell Air Gauge is controlled by the W. D. Newerf Rubber Company of Los Angeles, Cal., and is marketed by them.

A Remarkable Offer in Spark Plugs.—We want every one of our readers to look over the somewhat sensational announcement which is made in this issue by A. R. Mosler & Company, 163 West 29th street, New York City. They are willing to send to our readers as a trial order three of their "Triumph" plugs for one dollar. These plugs are designed to comply with the requirements where open end plugs are compulsory or where a satisfactory high-grade article is desired at a price which makes spitfire plugs prohibitive. The quality of the Mosler spark plugs is too well known to need comment, and we have no doubt that many of our readers will wish to cut out the coupon attached to the Mosler advertisement and to send for three plugs at the remarkable low price named. In writing do not fail to mention The Automobile Dealer and Repairer.

"Tire Sense."—The Twentieth Century Tire Protector Company of Midlothian, Texas, have recently brought out an interesting little catalogue entitled "Tire Sense," which will be sent to any reader interested enough to write for it. It contains full particulars of their tire protectors, together with testimonials.



The Rhoades Unit Spark Device. Manufactured by the New York Coil Co., 4 Dover Street, New York City.

well as the annoyance occasioned by faulty vibrator adjustment, worn timer contacts and many other ills are entirely avoided. The circuit controlling mechanism which is responsible for the extraordinary battery economy, perfect timing and other desirable features is of the most simple form, at the same time representing an entirely new and very ingenious mechanical movement. Interested readers are requested to write for free illustrated catalogue to the New York Coil Company, 4 Dover street, New York City. In writing mention this magazine.

Atlas Tire Chains Free.—The Atlas Tire Chain is already favorably known throughout the United States; but the manufacturers, in order to introduce it even more extensively, are making a remarkable trial offer. They will send to any of our readers, who will take the trouble to ask for it, one of their Cross Chains absolutely free, and will let you do your own experimenting. These Cross Chains are made of a high carbon steel with a drop forged center link. As it is only necessary for you to send a postal-card, which will take about a minute to write, we should suppose that thousands of our readers would be glad to avail themselves of this opportunity to inspect and test the Atlas chains. To receive a sample chain promptly, write to the Atlas Chain Company, Bush Terminal No. 4, Brooklyn, N. Y., and mention this publication.

advertisement which appears on another page in this issue. If you will also mention your dealer on the coupon they will send you in addition to the chart a valuable fully illustrated treatise on "Motor Car Lubrication." This book is just off the press and it is full of valuable pointers for the car owner. We advise our readers to cut out the coupon and send it in at once so that they may receive the chart and the treatise by the earliest possible mail. To insure the receipt of the chart and the book it is necessary for you to mention The Automobile Dealer and Repairer.

The "Gyrex" as a Gasoline Saver.—We have a very interesting full page announcement this month from the Royal Equipment Company, 450 Housatonic Avenue, Bridgeport, Conn. These people now manufacture the celebrated "Gyrex," which is a little device applied to the carburetor and the manufacturers claim that this saves ten to twenty-five per cent. of the gasoline, increases the power and delivers a perfect mixture to the engine. The manufacturers are so confident that the "Gyrex" will be satisfactory to our readers that they offer to send it to any of them on trial and if it does not prove its worth within ten days, if you will return the device the money will be cheerfully refunded. As the cost of the "Gyrex" is only three dollars we should suppose that a large number of our readers would wish to take advantage of this liberal offer. We

The Brown Impulse Tire Pump.

This new tire pump, which is here illustrated, is highly spoken of by those who have tested it. When a pump like this can be bought for a very reasonable price there seems to be little excuse for pumping up your tires in the old way. With this pump the motor does the

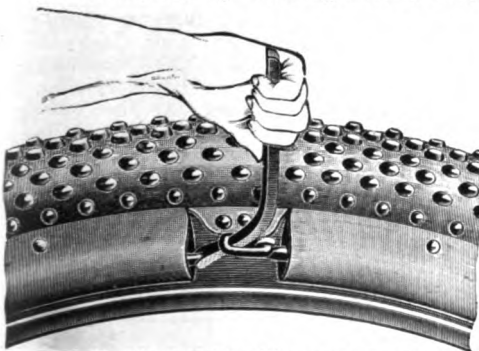


The Brown Impulse Tire Pump. Manufactured by The Brown Co., 1100 S. Clinton St., Syracuse, N. Y.

work. Simply insert the pump in the place of the spark plug and run the motor on low throttle and it is only the work of a few minutes to inflate a shoe. The pump will fit any car. For further particulars, price, etc., send for illustrated leaflet to the Brown Company, 1100 South Clinton street, Syracuse, N. Y., and mention this publication.

Applying the New Woodworth Tread.

We illustrate herewith the method of connecting up the springs when applying the new Woodworth Quick Adjusted Tread. This tread is held on the tire by rings on each side composed of coil springs. The coil springs keep an even tension on the covers at all times, preventing any possibility of looseness which might cause chafing or heating of the tire. There are from six to eight of these springs on each side of the tread. In each end of the springs there is screwed a strong hook and these hooks are connected by hooking into a steel



Hooking the New Woodworth Tread.

link fastened midway between the springs. With the tool illustrated above it is possible to draw up and hook the hooks in one motion so that the work is very quickly and easily done. When the treads are shipped a tool is tied to each one and an instruction tag telling how to apply it. The springs are all disconnected so that the tread is easily slipped sideways over the deflated tire. The springs are then connected by drawing up and hooking with the tool after which the tire is inflated and ready for use. For running up to speeds of 30 miles per hour, it is claimed that the treads will reduce the tire expense enough to pay for themselves more than twice over, besides doing away with

punctures and skidding. At very high speeds the treads will prevent punctures and skidding but the excessive strain occasioned by such fast running will generally cause the tire fabric to weaken and blow out so that the life of the tire cannot be prolonged as much as it can at lower speed. The new adjustment, making it possible to apply and remove the treads very quickly, overcomes the most serious objection that has heretofore been held against tire protectors.

Monograms for the Trade.

The Hickok Manufacturing Company, of Rochester, N. Y., make a specialty of monograms and initials for the radiators and doors of automobiles; also name plates for motor cars and motor boats. One of their specialties is the physician's red cross monogram, giving the right of way to the speeding sur-



An Attractive Monogram. Made by the Hickok Mfg. Co., Rochester, N. Y.

geon. All of the monograms manufactured by this company are made of solid German silver and heavily polished brass. Our readers are urged to write for their illustrated catalogue, which will be gladly sent free on application, if you mention this magazine.

Cable Support and Ignition Tester.

In this issue the Draver Manufacturing Company of Richmond, Ind., have an advertisement of their Cable Support and Ignition Tester. Write to them for further particulars and prices.

"Speed-Oil."—The Drake Oil Company of Titusville, Pa., come before our readers this month with an announcement of their "Speed-Oil," which, they say, is made in the heart of the Pennsylvania oil regions. If you have foul spark plugs, sticky cylinders, loss of power, etc., they recommend the use of their "Speed-Oil." They say "Speed-Oil" has a very high fire test and cannot, it is said, carbonize, with a result that those who use it can increase their speed if they want to, and it makes hill climbing easy. It keeps the engine clean and in perfect running order. Dealers are supposed to sell this oil everywhere, but if your dealer does not have it the company will ship direct and they say it won't cost you a cent if it does not suit you. At any rate write for their "Speed-Oil" booklet. It gives many particulars of interest. It will be sent free of charge to any reader who mentions The Automobile Dealer and Repairer.

Special for Dealers.—The Double Fabric Tire Company, 18 East 7th street, Auburn, Ind., have a full-page announcement in this issue addressed especially to dealers. They say their interlock inner tires "insure the most miles at least expense." They want every dealer who is a reader of this paper to cut the coupon out of their advertisement, fill it out with his name and address and send it immediately.

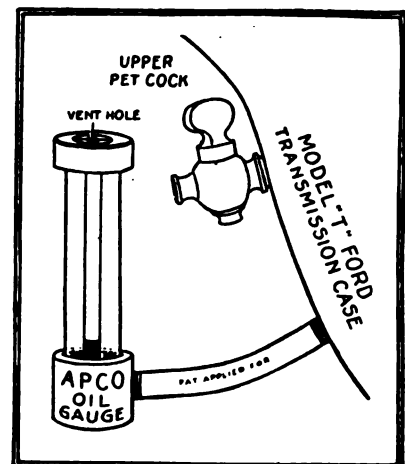
Rubber Putty.—This preparation is said to prevent blowouts, avoid sand

blisters, to save the fabric from decay, to keep out water and causes tires to wear evenly and smoothly. It requires no cement but will vulcanize itself and can be applied in five minutes without soiling the hands. The manufacturers say it will save a good many of our readers \$50 in the course of a season. It is made by The Toledo Auto Devices Company, 709 Gardner Building, Toledo, Ohio, and a can will be sent postage prepaid on receipt of \$1.25. This company would like to send its "Novelty Booklet" to any reader interested.

Gibney Eleck-trick Vulcanizer.—A new announcement appears in this issue regarding the celebrated Gibney Eleck-trick Vulcanizer which should interest every dealer in automobile supplies throughout the country, but at this time we also wish to call the attention of car owners to this device. This vulcanizer is exceedingly effective and any ordinary person who has access to an electric current can easily learn to use it. It will repair tires quickly and effectually and it can be attached to the ordinary electric lighting current. Every car owner who reads this publication will undoubtedly find it profitable to write at once to James L. Gibney & Bro., 221 North Broad street, Philadelphia, or if more convenient, to the New York office, 248 West 54th street, New York City, and get full particulars concerning this clever device by which the car owner may do his own tire repairing. In writing mention The Automobile Dealer and Repairer. The Eleck-trick Vulcanizer complete with repair kit retails for only \$15, putting it within the reach of every car owner.

Oil Gauge for Ford Model T.

This useful and convenient device is shown in the illustration. It takes the place of the lower pet cock on the transmission case and shows at a glance how much oil there is in the car. If you have the right amount of oil at all times



Apco Oil Gauge.

your car will not smoke, the plugs will not soot, the valves will not pit, and the motor will not carbonize. The sure way to keep the oil level right is to use an Apco Oil Gauge. Can be put on your car in less than ten minutes with a pair of pliers. Many consider it as necessary to the car as hands are to a clock, and it will save its cost in oil in a short time. The instruction book says open the pet cocks. But unless you're an acrobat you had better "get a gauge on." The price is but \$1.50. Address the Auto Parts Company, Providence, R. I.

Automobile Lighting.

The advent of low voltage Tungsten lamps was the beginning of successful electrical automobile lighting. This lamp's filament made from the metal Tungsten of which little was generally known, furnished the only thing absolutely necessary. During the three years since this lamp, now generally called Mazda, was first perfected many improvements have been made until now the filament wire is "drawn," greatly simplifying the mechanical problem of manufacture and furnishing a filament strong enough to stand vibration without breaking and consuming less than the electricity required by carbon lamps of equal candle power. Parallel with this development storage batteries, wire, switches, etc., have been improved and adapted to service conditions until electric lights are now dependable, give a brilliant penetrating white light and with greater convenience than other methods of lighting.

Two separate systems are in general use. The first, known as straight storage, has for its foundation a high capacity lighting battery which is the only source of current supply the battery having its charge renewed at a central station, garage or any source of direct current. A storage battery cannot be charged by alternating current. The other system is known as the dynamo lighting system and by this is meant that in addition to the storage battery a charging dynamo is installed on the car and keeps the battery in a fully charged condition by continually sending current into it whenever the car is running.

These charging dynamos cover a wide range of types. Each dynamo system must provide against overcharge of batteries by reason of speed variations, it must also provide automatic means of breaking the circuit between the dynamo and battery when the car is not in service. If this is not done the battery will discharge itself through the windings of the dynamo.

In both straight storage and dynamo systems success is largely influenced by the choice of installation material and the care with which it is put on the car. The proper insulation is also a very vital point. The focusing of the lamp in its reflector in headlights is very important, the variation of one-sixteenth of an inch producing a noticeable reduction in effective light.

Systems operating on straight storage frequently fail to give full satisfaction for the reason that a battery of too

small capacity is used. Again, the battery is sometimes taken off the line before it is fully charged. It is a good plan to leave the battery on charge at its finish rate for several hours after it has reached the maximum voltage. Central stations and garages which make a business of charging storage batteries should provide themselves with a hydrometer syringe and never allow a battery to go out unless its gravity reading is up to the proper mark and the voltage likewise.

Gravity reading may be taken at any time but voltage reading should only be taken when the battery is in actual service. Owners should see to it that electrolyte fully covers the plates in each cell and should they find that evaporation or "slopping" has lowered it, rain water or at least water absolutely free from mineral substances should be poured in until the plates are fully covered. Whether the battery is used or not it should receive a freshening charge at least once a month, and at no time should it be discharged below 1.80 volts per cell and it should never be allowed to stand for any length of time in a fully discharged condition.

Referring again to Tungsten lamps, the average size for sidelights need not be higher than 2 to 4 c.p., for tail-lights, 2 c.p. and for headlights, 16 c.p. When a dynamo system is furnishing current, higher candle power lamps may be used but very high candle power lamps in headlights are not altogether satisfactory because they are apt to blind the driver coming in the opposite direction.

Welding That Is Guaranteed.—The J. H. Deppeler Company, Inc., of Jersey City, N. J., have done much to develop the process of welding for automobile work. Two of this company's officers are graduate mechanical engineers, and for almost four years they have spent their entire time in experimental work in connection with the development of Oxy-Acetylene Welding. They have access to one of the best testing laboratories in the State, and this together with their deep interest in the welding process, has enabled them to thoroughly master every detail. Welding work is not so simple as it may seem. The metal each side of the break is melted, flowing together, actually forming a new casting in this part. Melting a central part of a casting, and still keeping the solid parts exactly the same distance apart and accurately in line is really a delicate operation.

In welding, the break is often beveled

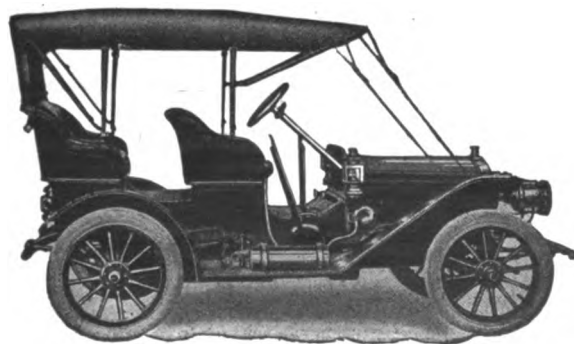
out V-shape and the slot filled in with molten metal carefully knitted into the sides of the V. When this molten metal solidifies, it contracts and pulls the sides of the V together. You can readily see then why something may give way. Perhaps the casting will shorten up on the welded side, in which case it will be warped. Perhaps the sides of the V will stretch sufficiently, in which case a strain will be introduced of more or less force. Such straining and warping can be eliminated only by the most careful treatment. In heating, metal will expand until a certain temperature is reached. Above this temperature there will be no further expansion until the metal melts. Now then, if a casting to be welded is first heated above this expansion point and then welded, the whole casting, molten metal and all, will be equally expanded. On cooling, however, the solid metal being at a lower temperature would cool below the temperature of complete expansion first. This must not be permitted, and is prevented by returning the casting to the preheating oven immediately after welding, thus raising the temperature of the body of the casting and lowering the temperature of the weld. When the temperatures are equalized, the whole may be allowed to cool slowly without the slightest possibility of the introduction of strains.

The J. H. Deppeler Company, Inc., give each customer a guarantee that has no end. If the welded part ever breaks in the weld, they will either reweld it, or if you prefer return the money paid for the welding. You don't get this guarantee with a new casting, and you have to pay more for the part.

Let the J. H. Deppeler Company weld your broken cylinders, crankcases, side frames, etc., and you will reduce the upkeep of your automobile by many dollars.

Welding Automobile Parts.—Our readers who may have automobile parts to weld, such as cylinders, crankshafts, crankcases, etc., can have this work done by the Western Welding & Manufacturing Company, 557 West Jackson Boulevard, Chicago, Ill. This company also manufactures the Oxy-Acetylene Welding Apparatus, they say the only one that is allowed by the "Underwriters' Laboratories" in insured buildings. Write to them for anything you want to know and mention The Automobile Dealer and Repairer.

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are the most satisfactory for individual owners and small garages—and we will let YOU prove it yourself!

STEAM IS THE ONLY METHOD OF DOING FIRST CLASS VULCANIZING AND EVERY TIRE MANUFACTURER WILL TELL YOU THIS. We will bet dollars to doughnuts that if you have an electric or other DRY-HEATED vulcanizer, your burn the tire at least once out of every five jobs you do. Isn't that so? When using a "National" Steam Vulcanizer, you don't "tell when the job is done by smelling the rubber burn." The "National" is a hollow brass shell partly filled with water and never needs refilling. It is heated by an alcohol lamp with adjustable wick. You do not have to watch it after you get up steam, which only takes a few minutes. The heat control is PERFECT. Will vulcanize both tubes and casings of any size. Not necessary to remove casing from rim to vulcanize. CAN BE USED IN THE COUNTRY OR ANYWHERE. Only weighs four pounds, and is packed in small wooden box to carry in tool box. Why bother with the dopes that fill up the holes and then come out in a day or two? Get a "National" and vulcanize them, and then forget there was a hole. Nearly 15,000 satisfied users. Ask your neighbor, he probably has one. Better still, order one today and try it yourself on your own tires. Seeing is believing.

FREE OFFER

We will ship a complete outfit including all supplies and instructions by express on ten days' free trial. If it is just exactly what we claim for it, send us \$12, or return the vulcanizer to us. **WE** take all the risk, but **WE** know what it will do. Order today.

Manufactured by

The National Motor Supply Co.
1914 Euclid Avenue, Cleveland, O.

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What we have to offer is of interest and value to prospective purchasers.

Convenient Terms of Payment.

Prospective purchasers owe it to themselves to inspect our stock before buying. A visit in no way implies an obligation to purchase.

WM. KNABE & CO.

5th Ave. and 39th St., New York City

Established 1837

A UNIFORM SIGNAL.

It must be admitted that there is a modicum of reason in the call for a uniform signal for automobiles, and if uniform there seems to be no reason why the sound should be either nerve racking or disagreeable. When it becomes generally known that the signal is a warning that an automobile is approaching and that the listener must look out, he will proceed to do so, and quite likely with rather more alacrity than if he were not absolutely certain what the sound meant as is often the case at present.

Of course, the warning sound, whatever it may be, should be sufficiently loud to attract attention from a distance, but its quality is not of such material importance; or rather both musical and harsh sounds have their advantages as well as their disadvantages, and the selection of that which seems most appropriate may well be settled by almost anyone not personally interested.

The main thing is to have a signal with which the public would be familiar and instinctively associate with the approach of an automobile. At present there are a dozen or more different kinds of automobile signals and in the large cities their babel of discordant sounds is often a bit confusing.

It is claimed that a car used under similar conditions of speed, weight and roads will run from two to three times farther on 33x4 tires than if equipped with 32x3½, both fitting the same rim. This is especially true when tires are overloaded.



MR. AUTOMOBILE DEALER AND REPAIRER.

See that Hammer? It is known as the "Uncle Sam Copper Hammer."

It IS a COPPER HAMMER, properly shaped, having the qualities suited to the many uses which you have for a Copper Hammer. We guarantee it not to rip or break from any reasonable blow used either as a hammer or buffer.

These Hammers are so tough that they can be hammered out of shape and back into shape again if necessary, taking all the bruise and removing the risk of breaking or defacing machinery parts, under which you work with a steel hammer or sledge.

We furnish any single Hammer for \$3.00, or better for your purposes, sets of two, for \$5.00; sets of three, for \$7.00; weighing 2½, 3¼, and four pounds respectively, as specified.

You need these Hammers in your tool kit for use at all times and for special use in any emergency to avoid the risk of a greater one.

Order now, while we can furnish them cheaply, owing to the low cost of copper.

Shipped by express, C. O. D., or upon receipt of price.

ELECTRIC SERVICE BEARING MFG. CO.

CINCINNATI and MILFORD, OHIO.

Orders to Milford, Ohio.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Open End Mosler Triumph 50¢ Competitive Plug

These plugs are designed to comply with the requirements where open end plugs are compulsory, or where a satisfactory high grade article is desired, at a price which makes Spit-Fire Plugs prohibitive.

The Triumph Plugs combine superior workmanship and perfect material at a minimum expense to the buyer. We are placing them on the market backed by our guarantee, that, for workmanship, material, efficiency and durability they are absolutely unequalled by any other open end plug before the public to-day.

Deep recess in the insulator. — Porcelain guaranteed to be hand turned.

Absolutely gas tight.—Pure asbestos wicking.

Stuffing box construction makes replacements easy.

Your dealer or jobber.

Direct on receipt of price.

As good as any—

Better than many.

To buyers who send in coupon to us attached herewith, we will sell **3 Triumph Plugs for a dollar.**

3 Plugs for a dollar will be sold only to holders of coupons. Otherwise, Triumph plugs are 50c. each.

#270

A. R. MOSLER & CO., 163 West 29th Street, New York

Sole Owners, Patentees and Manufacturers of

WORLD FAMOUS SPIT-FIRE PLUGS

Also Sole Manufacturers of

The Successful Breech Block Plugs

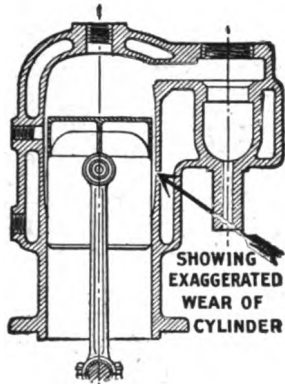
"The Plug with the Handle"



TRIAL ORDER
Good only until August 1st
3 Triumph Plugs for \$1.00
Send this coupon with your
remittance to
A. R. Mosler & Co.
163 W. 29th St.
New York
A.R.

THE UNDERWOOD METHOD OF REBORING AUTOMOBILE CYLINDERS

Is the **ONE** way of securing the accuracy which this work requires. An automobile cylinder must be round and true, and to **rebore** one in the proper manner is a difficult operation.



We are doing it with the utmost accuracy and precision because—

We have designed and built special machines just for this work.

Our business for the past forty years has been reboring all sizes of engine cylinders and we are cylinder reboring experts.

Our process is original throughout and produces the best results obtainable.

Send the cylinders that have worn out of round and lost their compression, to us. Or if the cylinders are cut, we can rebore them true and accurately.

You do not have to get a new motor.

Our work is guaranteed.

We make and fit new pistons and rings in a manner consistent with our reboring process to secure excellent finish and strong compression.

Start those old cylinders in our direction at once.

H. B. Underwood & Co.

1019 Hamilton Street

Established
1870

PHILADELPHIA, PA.

Restoring the Valve Lift.

It often happens that, in cars that are several years old, the valve timing is lost through wear of the cams and their followers. It is, of course, a simple matter to supply new rollers or even entire new followers, but with the cams it is a different proposition, since they are in the majority of cases made integral with the shaft. And even where they are separable from the shaft, it is a little too much of a job to be entrusted to the ordinary garage or repair shop. In any case, the so-called "cam-circle," that part of the cam upon which the follower rests when the valve is seated, is always of a somewhat greater diameter than the shaft. Also, the chief wear upon the cam is over the face that lifts the valve and the nose of the cam which holds the valve open. This wear reduces the angle through which the valve is open as well as reduces the lift, so that no amount of adjustment, as such, can be made to restore the timing. In a case like this the cam shaft can be removed from the engine and the circular part can be ground down enough to restore the cam to its original outline, in effect at least. In this way the arc of opening and the maximum lift of the cam can both be made the same as when the engine was new.

Close the throttle to the lowest point at which the motor will keep running regularly, when the car is standing with the engine in operation. This will reduce engine wear and tear, fuel and oil waste and noise.

On stopping don't drive up to the curb and jam on the brakes causing the rear wheels to drag.

TIRE BARGAINS

We invite a visit to our Newly Opened Salesrooms at
1708 BROADWAY

Where we offer both

"FIRSTS" AND "SECONDS"

Of various well-known makes at extremely low prices.

Absolutely New 1911 Imperial Tires
CLINCHER, UNIVERSAL and DUNLOP

28x3.....\$9.75	32x4.....\$16.75
30x3.....10.25	33x4.....17.50
32x3.....10.50	34x4.....18.50
30x3½.....13.50	35x4.....18.75
32x3½.....14.50	36x4.....19.50
34x3½.....14.75	34x4½.....23.50
30x4.....16.25	35x4½.....24.50
31x4.....16.50	36x4½.....25.50
	37x4½.....26.00

STERLING TIRES

Not many left just now but if any of the following fit you, then here's your opportunity for a real bargain in this superior make of tire.

32x3.....\$11.00
34x3½.....15.75
32x4.....17.75
34x4.....21.00
36x4.....21.50
32x4½.....17.50
34x4½.....25.75
36x4½.....26.50

STERLING BLUE TUBES

(Samples on Request.)

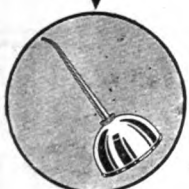
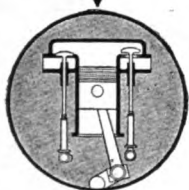
28x3.....\$2.75
30x3.....2.90
30x3½.....3.65
32x3½.....3.85
34x3½.....3.95
30x4.....4.00
31x4.....4.20
32x4.....4.40
33x4.....4.65
34x4.....4.75
36x4.....4.90
34x4½.....5.20
36x4½.....5.45

TIMES SQUARE AUTO CO.

1710-12-16-18 BROADWAY

Near 54th St.

Telephone, 7366 Columbus



TRACE back your automobile difficulties and you will locate many of them in the cylinders.

Trace back cylinder troubles—pounding, misfiring, etc.—and you will usually find a deposit of carbon.

Trace back the carbon deposit and you will find the fault in the lubricating oil.

There you have the cause of most gas engine difficulties.

After several years of painstaking effort we have produced an oil that marks a distinct advance in gas engine lubrication.

This oil practically eliminates the most frequent cause of gas engine troubles—carbon deposit. The oil is called Polarine.

Polarine Oil maintains at all times an elastic film between the moving surfaces.

It flows freely at all speeds and all temperatures. It does not get too thin at high temperatures, nor congeal at zero.

Polarine

The Polarine brand covers:

Polarine Oil, sold in sealed cans, gallon and half-gallon sizes; or in barrels and half-barrels.
Polarine Transmission Lubricants, in three consistencies, for transmissions and differentials; sold in cans of convenient size, also in barrels and half-barrels.

Polarine Cup Grease and *Polarine Fibre Grease*, the latter of high melting point, particularly adapted for use on universal joints. Sold in round cans.

Liberal use of Polarine Lubricants will save you many embarrassing delays and lengthen the life of your car.

Standard Oil Company
(Incorporated)

Send to our nearest agency for "Polarine Pointers." It includes hints on lubrication and the causes of engine troubles.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Reboring Automobile Cylinders.—To properly rebores an automobile cylinder requires peculiar and delicate mechanical skill, and is a much more difficult task than many readers might imagine. H. B. Underwood & Company of Philadelphia, for more than forty years, and of course long before the days of the automobile, had been reboring engine cylinders of from 3 to 100 inches in diameter, and naturally they were called upon, early in the industry, to rebores the cylinders of automobiles.

It was soon found necessary to put in special machinery to do this work, so as to perform this operation without distortion, and in a true accurate manner. After an internal-combustion motor has been running sufficiently, the

cylinder will naturally wear, by the innumerable times the piston travels back and forth and will not hold compression. This means, not only a loss of power, but a waste of fuel as well. Sometimes, too, a piston pin will work loose and score the cylinder very deeply on both sides. Also a lack of lubrication will cause the cylinder to be scored, which likewise destroys compression. Reboring, to be of any value, must be done accurately or the cylinder, in all probability, will be ruined.

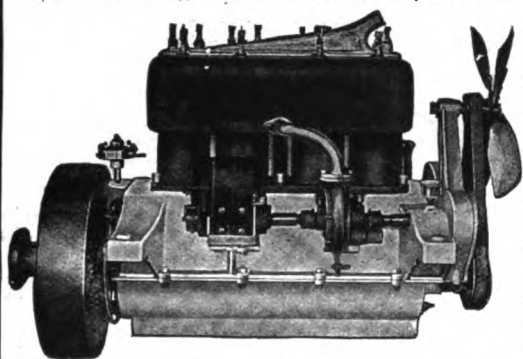
It is a fact, that anyone, not familiar with the proposition, is apt to consider it a very simple piece of work, but engineers and experts who appreciate the difficulties, know that reboring a blind cylinder accurately, is almost an art.

If you send an automobile cylinder to

H. B. Underwood & Company for reboring you may be absolutely confident that the work will be well and accurately done. Many experts hold that after a motor has been used for a while, even if the cylinders do not appear to be badly worn, it is an advantage to have the cylinders rebored. The same firm also makes and carefully fits new pistons and rings, which are lapped in the rebored cylinder, to secure a fine finish and strong compression.

Readers who have cylinders to be rebored, or who may for any reason be interested in the subject of cylinder reboring should write for particulars to H. B. Underwood & Company, 1019 Hamilton street, Philadelphia, Pa., not forgetting to mention The Automobile Dealer and Repairer.

LONG-STROKE, LARGE BEARINGS, LARGE VALVES



New Design of Block Motor

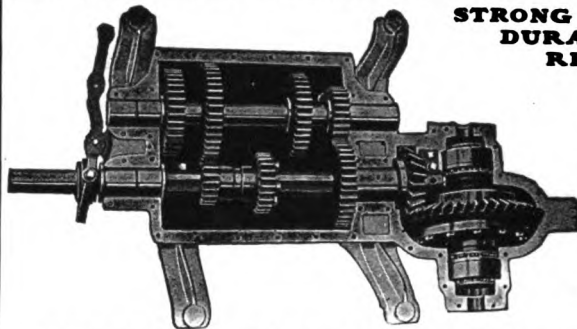
3 Bearing
Crank Shaft
Strong
Substantial
Reliable
and Smooth
Running

BRENNAN
Motor Co.
101 GRAPE ST.
SYRACUSE, N. Y.

Write us for
catalogue and
information.

SYRACUSE GEAR CO.

**STRONG
DURABLE
RELIABLE**



No. 5 Gears,
1½ in. face,
5 pitch.

No. 4 Gears,
1½ in. face,
6 pitch.

Fitted with
Equalizing
Gear for
double chain
drive.

Intended for the heaviest types of pleasure and commercial cars.
Also Planetary and Selective type transmissions.

SYRACUSE GEAR WORKS, 104 Grape Street, Syracuse, N. Y.



Tire Troubles Stopped

Wear the treads completely off your tires without puncture,
blow-out or rimcut by inserting the

DAYTON INNER TIRE

Inexpensive

Inserted and removed and placed in other tires by anyone.
Write for a descriptive price list to-day.

DAYTON INNER TIRE & MFG. CO., 19 Madison St., Dayton, Ohio

**YOU "AUTO"
TRY IT.**

TRIUMPH LEATHER VARNISH!

**SAVES AUTO SEATS
AND TOPS.**

You Can Bring Back that New Look to Your Old, Worn Auto Seats and Tops, and Prolong the Life of Your New Auto Seats and Tops, By Using Triumph Leather Varnish.

The only satisfactory Leather Varnish manufactured in the United States that is guaranteed to give the results the manufacturer claims it will.

It Has Been Tested Thoroughly. That is why we can guarantee it. We know that results will come. The man who patented the formula has tested it in various ways. He wanted to be sure the mixture was right before he put it on the market. Triumph Leather Varnish produces a High Natural Finish, it preserves the Leather, it will make it soft and pliable, will not rub off, will not crack or blister. It is a durable, water-proof coating that stands the sun and rain. Contains no acid and will not injure the leather.

One pint of Triumph Leather Varnish is sufficient to cover the Seats or Top of any Car. Apply with a soft ordinary brush, thin and evenly. Dries in fifteen minutes. Ask Your Auto Supply Dealer for Triumph Leather Varnish. If he cannot supply you, write us and we will supply you direct.

MANUFACTURED ONLY BY THE

NOVUS HOMO MFG. CO., 1340 Fond du Lac Ave., Milwaukee, Wis.

TO DEALERS AND JOBBERS:—Write us for our price list to-day. We want live Auto Supply Dealers to be well stocked. There is bound to be a demand for Triumph Leather Varnish.

AGENTS WANTED ALL OVER THE UNITED STATES.

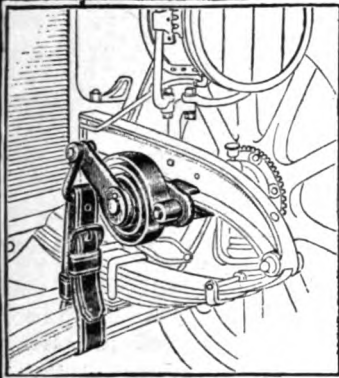
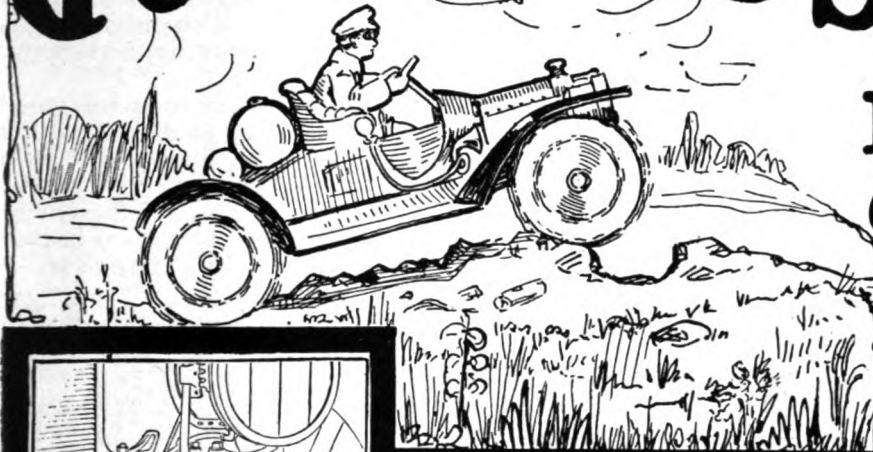


Please mention the Automobile Dealer and Repairer when writing to advertisers.

GOOD ROADS ARE NOT NECESSARY

IF YOUR CAR IS EQUIPPED WITH

SKINNER RECOIL CHECK



"THEY MAKE YOUR CAR RIDE SMOOTH ON ROUGH ROADS"

"Eliminate all Spring Breakage"

"Make Motoring a Pleasure"

They act in harmony with the road, adjusting themselves to boulevards and rough roads alike. Do not interfere with or stiffen the springs, but prevent the reaction and up-throw jolts. Nothing to wear out or get out of order, and a set will positively prevent all spring breakage.

CLAMP ON THE FRAME. NO HOLES TO DRILL. So simple that anyone can attach a set in a few minutes' time. Don't put up with the discomforts any longer. **ORDER TO-DAY.**

\$20.00 per set of four, for cars weighing under 3,000 lbs.

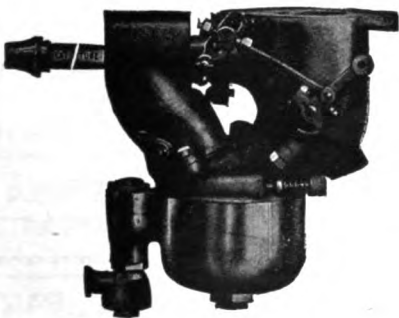
\$25.00 per set of four for cars weighing over 3,000 lbs.

Give name of Car, Model and Year Made.

SKINNER & SKINNER CO.

Manufacturers
1718 Michigan Ave., CHICAGO, ILL.

MARVEL CARBURETER
THE NAME DEFINES IT



Model H

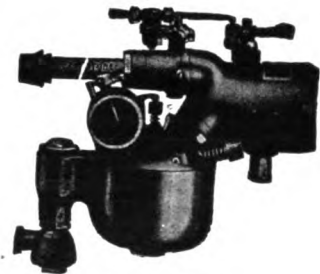
You wouldn't know your car was
so fine until you use a

MARVEL

Our Principle:

Little gas, lots of heat.

Lots of gas, little heat.



Model T

Results:—Flexibility—greater than dreamed of, and saving fuel too.

A Post Card for YOU
if you name the Car

MARVEL CARBURETER CO.

2225 Alvord St., Indianapolis, Ind.

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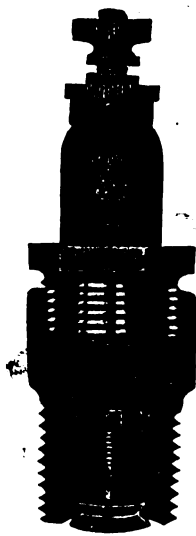
THE GENUINE MAHER DUPLEX MULTI

Only Genuine Self Cleaning Spark Plug on the Market

IN THIS SPARK PLUG is embodied a double annular spark gap, one working auxiliary to the other. The sparks ordinarily cross the upper spark gap; thus, should the sparks fail to cross the upper gap for any reason, the lower flange provides an auxiliary spark gap, insuring the proper sparking and ignition of the gas to obtain the best results. The lower flange or electrode closes the end of the firing chamber in such a manner that it also acts as a baffle to keep the oil from entering.

The enclosed firing chamber in which gas, accumulated under pressure during the compression stroke and being fired up in the cavity, is shot forcibly out into the cylinder upon ignition, carrying with it all soot and foreign matter, causing the spark gaps to be automatically cleaned and also causing a complete combustion of each charge. Porcelain cannot break thru heat or expansion as it is shielded from direct contact of the hot and cool gases of the explosion and compression strokes. Price \$1.25.

N. B.—“This ad. is worth \$0.50 per plug up to six plugs, when sent in accompanied by 75 cents for each plug ordered.” (List price, \$1.25.)



Pat. Feb. 7, 1911.
and Pat. Pendg.



Pat. Feb. 7, 1911

Write for Dealers' Discounts

THE DUPLEX MULTI-SPARK PLUG CO., Devil's Lake, North Dakota.

Uautoil WITH ENDURANCE AUTOIL

FROM PREMIUM PENNSYLVANIA CRUDE

And Keep Engine Free from Carbon,
If You Want it Smooth-Running and Powerful.

Write for OUR SPECIAL OFFER to send you some ENDURANCE AUTOIL (freight charges prepaid) to

Try at Our Risk for 30 Days

with privilege of returning and no charge for oil used if it don't suit.

Booklet (A gives more real information that you want to know about oils than can be obtained elsewhere. It's FREE. Ask for it.

ENDURANCE AUTOIL CO., MUNCIE, INDIANA



3 1/2 x 4 1/2, Fairbanks-Morse
Single Acting Compressor
Air Cooled

Air Compressors for Garage Use

The wide flanges keep this compressor cool. Will operate at 250 R. P. M. against 100 lbs. pressure.

A well built and durable compressor which fully meets the requirements of private or public garages.

Write for Catalog No. SA1419.

Fairbanks, Morse & Co.

Wabash Ave. and Eldredge Court, Chicago, Ill.
30 Church St., New York

These Destroy Tires.

“Anything which prevents the wheels of a car from running parallel will cause tire trouble,” says the Michelin man. “Too much play in the axle end bearings, too great a freedom in the steering joints or possibly a bent spindle or axle end invariably exacts its penalty. Brakes too, when they are out of order, do damage to tires. Should only one of the back wheels lock when applying the brakes the tire on the slipping wheel will surely be injured.

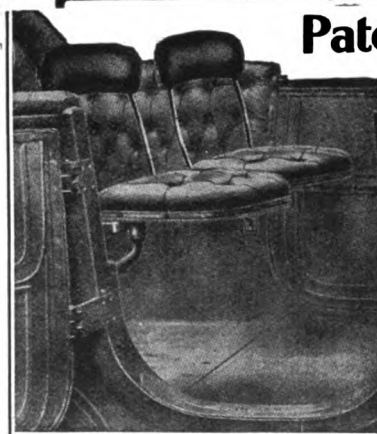
“Another kind of tire trouble arises from weakened springs. Every time the car jolts badly the upper part of the tire rubs against the mudguard and as a result the envelope is injured. Driving chains also are often the cause of injury to tires. If the chains slack the swinging motion produced by the car in running will cause the lower part of the chains to strike the side of the tires.

“When the chain line is too close to the tires or when the chain bolts are too long they rub the envelopes, making oblique scratches on the rubber. These cuts or scratches on the inner side walls of the tires are crossed at regular intervals, first when the bolts pass on the upper and again when they pass on the lower part of the side walls.

“Oil or grease from leaky or overfilled tanks should not be permitted to reach the tires because oil and other fatty substances are most injurious to rubber.

A Cracked Water Jacket.

A reader says he repaired a cracked water jacket with the aid of a can of putty. He scraped a piece of asbestos into fine particles and mixed it with the putty, about two parts of asbestos to one of putty, and then filled the crack with this mixture with the aid of a small packing tool. At last accounts the jacket was not leaking.



Patent Luxury Folding Seats

Made from steel drop forgings; artistic in design and finish; compact, rugged and durable.

A necessity of high grade car equipment.

Write for catalog showing various models.

Graves & Congdon Co.
AMESBURY, MASS.

WELDING AUTOMOBILE PARTS

Cracked or Broken

Cylinders, Crank Shafts,
Crank Casts, Housings, Frames,
Axles, any metals of any shapes or
thicknesses, including

ALUMINUM PARTS

All work
absolutely
GUARANTEED



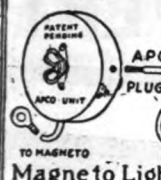
Manufacturers of welded (seamless) gasoline and oil tanks.

Write for estimates.

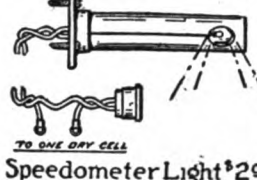
We also manufacture the only Oxy-Acetylene Welding Apparatus allowed by the Underwriters Laboratories in insured buildings.

Western Welding & Mfg. Co., 557 & 559 W. Jackson Boulevard, Chicago, Ill.

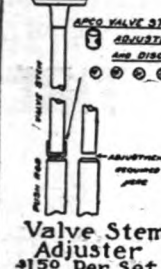
Please mention the Automobile Dealer and Repairer when writing to advertisers.



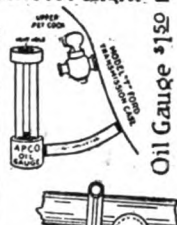
Magnet Lighting Outfit
\$5.00




Speedometer Light \$2.00



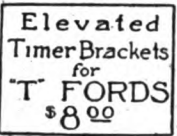
Valve Stem Adjuster
\$1.50 Per Set




Oil Gauge \$1.50




Muffler Cut-Out
\$1.50 With Pedal



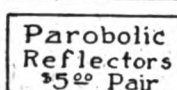
Elevated Timer Brackets for T FORDS
\$8.00




Aluminum Heel Plate
\$1.00



Valve Spring Covers
4.00 Per Set

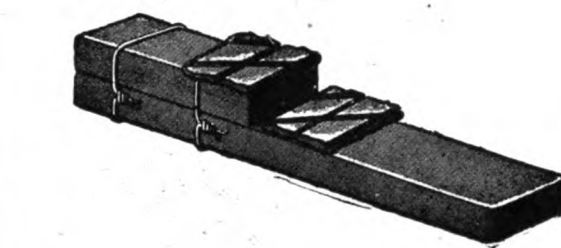


Parabolic Reflectors
\$5.00 Pair



Valve Spring Remover
\$1.00

FORD OWNERS
15
APCO Specialties
Ask Your Ford Agent He Knows
Catalog "N" FREE
Auto Parts Co
Providence, R.I.



LAFFITTE BRAZING COMPOUNDS IN THE GARAGE.

On a breakdown or rush job use the LAFFITTE BRAZING COMPOUNDS. The car can be put into service immediately after the braze is completed.

It is not necessary to dismantle the car—as the Compound can be applied to the most inaccessible parts.

All necessary ingredients contained in the one piece.

Saves you 33% in Time, Fuel and Labor.

SEND FOR SAMPLES—FREE.

IN THREE GRADES TO MEET ALL CONDITIONS.

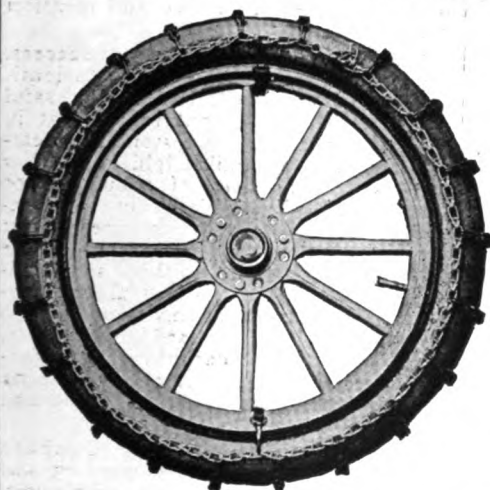
No. 1 for brazing brass, red copper bronze and cast iron.

No. 2 “ “ red copper and iron.

No. 3 “ “ iron and steel.

THE PHILLIPS-LAFFITTE CO., Penna. Bldg., Phila. Pa.

“The Chain That Lasts”



The
“BEST”
Traction
Chains

Always have been. We intend they always shall be. Infringe NO Patents.

Have not reduced the number of cross chains to lessen our cost. When we can't give an honest chain, we'll quit.

Our Adjuster fits any size chains.

Let us tell you more about our goods and quote you.

H. E. McLAIN & CO.
162 Pond Street, Natick, Mass.

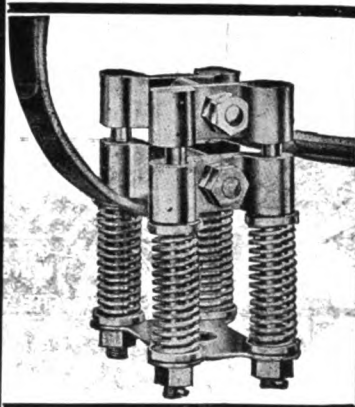
PACIFIC COAST AGENT,

JOHN F. REVALK, 568 Golden Gate Ave., San Francisco, Cal.

VELVET Auxiliary SPRINGS.

WHY NOT

Make your car ride as easily as a Velvet Cushion ALL THE TIME? Velvet Springs make rough roads smooth, and absorb the jolty, irritating, jiggly motion, caused by cobbles stones and rough roads and by stiff auto springs, or springs which are too resilient.



You will realize that a spring cannot be too stiff and too resilient at the same time.

They prolong the life of your car;—the tires;—the engine;—and all working parts, and will pay for themselves in a few weeks.

Can attach in a few moments. They allow no side sway. No machine work or fittings needed;—strong, durable, cannot twist out of shape.

In writing give name of car;—weight;—width of spring;—and size of spring bolts.

Special Offer—You Take No Chance.

You can send remittance, use for 15 days, and if not satisfactory, return and get your money. **WRITE NOW for prices.**

AGENTS & BUYERS: Insist upon having your new cars equipped with VELVET SPRINGS. You might as well have an easy-riding car as a hard-riding one.

New England Agent, W. J. Connell, 555 Boylston St., Boston.
San Francisco: J. F. Revalk, 568 Golden Gate Ave.

JOHN W. BLACKLEDGE MFG. CO.,
1502 Michigan Avenue, CHICAGO, ILL.

EVERY·AUTOIST·A·CUSTOMER·&·EVERY



THAT'S what you want, friend DEALER, and that's good news involved in the handling of

THE RACINE AUTO TIRE

We'll tell you why!

BECAUSE, your customer will not be worried by seeking to avoid the many sharp things that puncture other tires, for they won't puncture THE RACINE as it takes a pressure of over 4,000 pounds to puncture the chrome tanned leather outside jacket.

BECAUSE, your customer will find it unnecessary to carry that extra tire; four good revolving tires (RACINE AUTO TIRES) being all he will need.

Unique Selling Policy for Shock Absorbers.

The Connecticut Shock Absorber Company of Meriden, Conn., manufacturers of the well-known Connecticut Shock Absorber, have for several months past followed an original selling plan which meets with a good deal of response from motorists the country

work of installation is thus accomplished under the indirect supervision of the home factory. It not only relieves the dealer from responsibility to his customer, but what is more, it takes the burden back on the manufacturers, who, through the installing station re-assume direct responsibility to the customer. Installing stations have been established

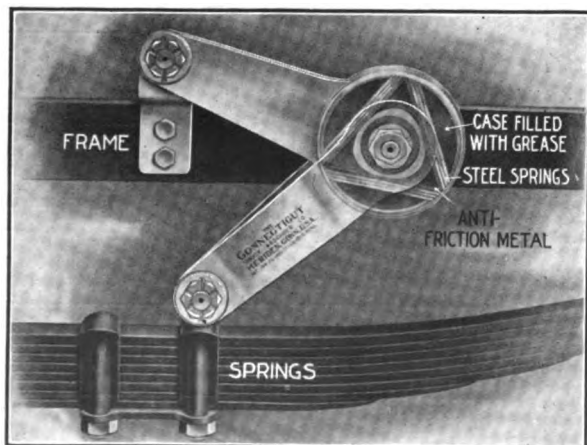
necticut Shock Absorber Installing Station." For full particulars and prices, address the firm as above and mention this magazine.

"Business Science" Proves a Success.

—Exponents of the doctrine of "scientific management" will find a successful example of the idea put to the test in the new plant of the Keystone Lubricating Company, in Philadelphia. Its new plant covers an area of about 100,000 square feet. Every detail in the construction and system of the great plant combines to form a harmonious whole in which clean and healthful surroundings, safety devices, cheerful environment and sane economy combine to form the highest standard of efficiency. The building is a "daylight plant," having been built with a view of obtaining a bountiful supply of natural light and ventilation.

The Keystone Lubricating Company has taken pains to insure comfort and sanitary conditions for its employees. A bright and cheerful dining room has been installed for the help, adjoining a similar room for the use of the officers and heads of departments. And already the tremendous increase in business is justifying the faith of the firm in the idea. The Keystone Lubricating Company is one of the largest manufacturers of high-grade lubricating grease in this country. Branch offices and warehouses are located in all the principal cities of the United States, while a chain of agencies extends throughout the world.

Garage Air Compressor.—These are made in several sizes and styles, especially for garage work, by Geo. S. Comstock, of Mechanicsburg, Pa. Write to him for further particulars and prices.



Shock Absorber, Manufactured by the Connecticut Telephone & Electric Co., Meriden, Conn.

over. These shock absorbers are sold installed on the car; in other words, there is no charge for attaching. This plan, which incidentally solves the problem of correct installation on a car, is carried out through the aid of Connecticut "Shock Absorber Installing Stations," which take care of this work in the territory which they cover. The

in practically every city of note in the United States.

Connecticut Shock Absorbers at the present time are made in two sizes, "Standard" size, and the "Light" set. Each includes free installation, providing, of course, they are put on by one of the regular installing stations. These stations all bear a uniform sign: "Con-

CUSTOMER·A·SATISFIED·CUSTOMER

BECAUSE, those cup like studs that you see in our illustration will grip the ground just where, and just when, the ground needs gripping; so that he is free from the danger of skidding and slipping.

BECAUSE, his tire EXPENSE account will show a difference such as will cause him to talk enthusiastically to others about you and the RACINE AUTO TIRE.

All this counts for good business; so get busy. The RACINE AUTO TIRE is going into the hands of live, pushing dealers. We shall make it equally advantageous to them as to us. Be amongst the live ones. Take our proposition. Do it now; and together let us do it thoroughly.

RACINE AUTO TIRE CO.
RACINE, WISCONSIN



Here is an Opportunity to Get a High Grade Touring Cap FREE.



You can get a hat for yourself, for your friend, perhaps your entire family can obtain hats **FREE**. If you are interested, write us. We will send you full particulars. This is no catch-penny scheme but a genuine offer and the proof of it is to put us to the test.

Just write us, asking for our Catalog, Edition No. 26, and full particulars will be sent. Send us a postal at once, and let us introduce you to the most extraordinary offer that has ever been presented to motor car owners.

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Main Offices,
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(A THICK OIL CREAM METAL POLISH—leaves no powder or sediment—best for quick action, brilliancy and lasting lustre.

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San Francisco, Cal.....Weinstock-Nichols
Co.; Pacific Sales Corporation Co.;
Chandler & Lyon Motor Supply Co.;
also at Los Angeles and Fresno, Cal.,
Seattle and Spokane, Wash., Port-
land, Ore.
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CROWN MANUFACTURING COMPANY, Indianapolis, Ind.

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It seems simple enough to melt the edges of a crack together by means the Electric Arc or the high temperature Oxy-Acetylene Flame.

BUT

We as Engineers have spent almost four years studying and experimenting.

The welding is simple enough, but the weld must contract, and unless the cylinder or crank case has received just the proper treatment it will be warped or there will be shrinkage strains that may break it again in the future.

THEN WHY

Will you send your expensive automobile parts to some welding company whose only virtue is that its founders have had money enough to buy a welding plant?

The cost of the best welding plant is not 1/10th of what we have spent on experimental work.

We have built our business by satisfying every customer; moderate prices, good workmanship, promptness in delivery, and a guarantee that never ends.

We Solicit Your Patronage.

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Guarantee "REX" fully—we will stand back of every proper claim you make.

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2150 AUSTIN AVENUE, CHICAGO, ILL.

Swing in Space.

Charles E. Stone, manager of Alden-Sampson Manufacturing Company, spoke on "The Use and Abuse of Motor Trucks," recently at the opening of a new term of the Automobile School of the New York West Side Young Men's Christian Association. Mr. Stone said in his lecture:

"In New York over 140,000 horses are used in daily trucking. Were this army of quadrupeds harnessed tandem fashion to a vehicle, the first animal would be entering the city of Worcester, Mass., or Scranton, Pa., before the wheels of the vehicle to which they were harnessed started to turn out of New York City.

"Probably the majority of these horses could be entirely dispensed with by a substitution of the motor vehicle, thereby adding nearly three hundred miles of streets to our city. What such an elimination of the horse and its co-partner, the fly, would mean to the health of the community is almost beyond record."

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A car driver had a bad blow-out in one of the front tires of his machine when out in the country, and not having an extra shoe along to make a change, he called on a farmer and secured a quantity of oats and a small piece of an old feed bag. The injured tube was removed and the shoe stuffed tightly with oats, the piece of bagging being placed on the inside of the shoe to prevent the oats from coming out. In this way he was able to drive to the city garage without running the car on the rim and further injuring the shoe. This would probably work only on the front wheels.

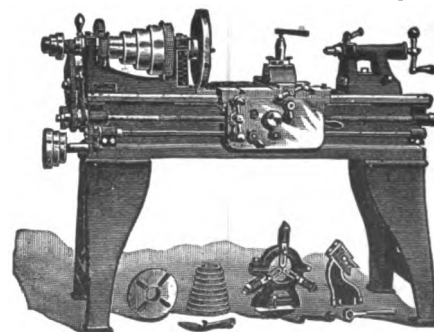
WE are fully equipped to rebuild or repair any type of Radiator. Send your work to us via express. We will examine and report the cost, awaiting your order to proceed. Special attention paid to Radiators bearing this name plate.

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— ROME, N. Y. —
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LATHES

LATHES



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Will you not write us for a copy of our catalogue and a price on one of these lathes?

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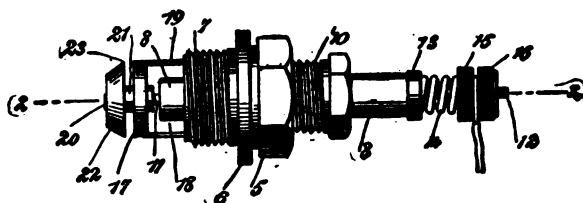
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Applied for March 24, 1902



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What Wisdom, Gathered From Experience, Tells.

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Gentlemen:—I have used the "Best" Spark Plugs in a 4 cyl. Buick Car, and find that they are the only plug out of several that would give satisfaction. I have used one set of Plugs over 7,000 miles without removing any parts.

Truly yours,
(signed) Allen A. Knapp.

The Best Ignition Equipment Co.,

Gentlemen:—Since using your "Best" Spark Plugs in my Buick Car I have never had any trouble with oil and do not give them any attention whatever. Previous to using your Plugs I had a great deal of trouble with oil in the cylinders and loss of power. I do not hesitate recommending them to those who are troubled with spark plugs.

Very truly,
(signed) F. C. Swartz, Blaine, Mont.

What the Doctors Say:

Wellborn, Fla., May 17th, 1911.

Best Ignition Equipment Company,

Gentlemen:—I have used your "Best" Plugs on my MODEL 10 BUICK for more than a year. They have given me perfect satisfaction and I would not be without them. Yours very truly,

(signed) J. E. Pennington, M.D.

Albany, N. Y., March 9th, 1911.

The Best Ign. Equip. Co.,

Gentlemen:—The "Best" Plugs have given me better satisfaction than any others I have ever used. Yours truly,

(signed) Dr. Sam'l B. Ward (a Buick owner).

Fremont, O., May 24th, 1911.

The Best Ignition Equip. Co.,

Gentlemen:—The Plugs work fine. I have not had to clean them since in use. Yours respectfully,

(signed) E. L. Vermilye, M.D. (a Buick owner).

If you motor in hilly country, equip your car with these plugs, and see the new energy your motor will have.

THE BEST IGNITION EQUIPMENT CO.,

200 West 64th Street, New York.

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Ashland, Pa.

The "Best" Plugs are truly the best. I need not look at them at all, they are always as free from carbon and oil as my hand. They are great for my Ford Car.

Yours, etc.,
(signed) L. A. Snyder.

November 27, 1909.

Best Ignition Equipment Co.,

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Yours respectfully,
(signed) Albert E. Stacy.

New York, May 2nd, 1911.

The Best Ignition Equipment Co.,

Gentlemen:—I have been using your "Best" Plugs for the past three years and consider them the best proposition on the market, as they are the only plugs I have secured to date that will fire through oil.

Yours very truly,
(signed) F. F. Proctor, Jr., Gen'l Manager,
F. F. Proctor's Theatrical Enterprises.

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Be wise, save money and get a year's guarantee—send this coupon with your remittance. This offer is limited.

BEST IGNITION EQUIPMENT CO.,
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Enclosed find.....Dollars, for which please send me a set of....."Best" Spark Plugs, at \$1.00 per plug, quantity.....carriage charges paid. Size.....Car.....Model.....Year....., and your guarantee for one year.

Regular Price,
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Under this head will be printed advertisements of shops for sale or to rent, or shops wanted, or situations or help wanted, or tools or machines (second-hand) wanted or to exchange, at the uniform price of three cents a word, which will include the address, for each insertion, payable in advance. No advertisement will be inserted for less than 50 cents, however small.

Remittances can be made in postage stamps if more convenient. Address,

**MOTOR VEHICLE PUBLISHING CO.,
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SEND US YOUR BROKEN CYLINDERS,

and crankcases to be welded at less than one-quarter the cost of new ones. Work absolutely guaranteed. Pay only after testing. Write for references and prices. Waterbury Welding Works, Waterbury, Conn.

TOPS—Until further notice, runabout top \$20, touring car tops \$35. C. G. Meyer & Son, Tiffin, Ohio.

PATENTS SECURED—C. L. Parker, patent attorney, ex-examiner Patent Office, 962 G Street, Washington, D. C. Inventor's handbook upon request.

STEAM CAR CORRESPONDENCE SCHOOL. Finely written and illustrated course. Only school in world. Circular sent. 520 Fourteenth Street, Denver, Col.

Broken Crankshafts, Crankcases, Gears,

Flywheels, Welded. Pay after you test them. Broken cylinders made new, \$3.25. Atlas Welding Works, Rahway, N. J.

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FOR SALE—"Steam Car Owners." Myers Kerosene Burner—Something new. Send for circular, 729 West Colfax, Denver, Colorado.

CYLINDERS REGROUND, and fitted with new pistons and rings for \$15.00 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. Phosphor bronze bushings in the rough carried in stock. Address, The Adapt Machinery Company, 1624 Wabash Avenue, Chicago, Illinois.

AUTOMOBILE CYLINDERS rebored, ground, including new piston and rings, \$15. Electric and belt-driven Tire Air Compressors our specialty. Cast Iron Brazing Co., Manchester, N. H.

BUILDING or repairing an auto? If so, send for list and state your wants. "Mail Order" Garage, 3 Fox St., Bridgeport, Conn.

AUTO TOPS Rebuilt, Repaired, can save you money. Rubber and Mohair Dust Hoods for model T Ford Touring and Roadster, 1911 cars, Leather Fore Doors, if wise get our prices. Haews Storm Front Co., Coldwater, Michigan.

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life away, but finish the brass parts of your auto with **Stay Shiny**—The Marvelous Tarnish Preventive, and have them look gold plate all the time. Saves hard, dirty work, time and money. One invisible coating preserves original high polish and absolutely prevents tarnish on lamps, radiators and trimmings for months under heat, rain, and all weather conditions. Easily applied, easily removed when desired and non-injurious to metal. Fully guaranteed. Price \$2.00 pint can, with brush. Express prepaid. A year's supply. Thousands of auto owners are delighted users of this long looked for preparation. Agents wanted. Easy seller. Big profits. If not sold by Dealer, will send can prepaid upon receipt of price. Write me right now.

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MAXWELL, BUICK, FORD, BRUSH and REO owners write us at once and ask for catalog. Grand Haven Auto Body Co., Grand Haven, Mich.

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1000 GUARANTEED.—\$2.00 Pocket Ammeters for testing batteries, beautifully nicked, in chamolite leather case, 25 cents postpaid. Stamps taken. Electricians, 3525 Broadway, New York City.

200 One and one-quarter inch pitch roller chains. \$1.50 each. Mail Order Garage, Bridgeport, Conn.

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FOR SALE.—Two 30 x 3 1/4 Woodworth tire covers, spring fastened, good as new, run about 600 miles. Price \$10.00 for the pair. Address, Norton McCordle, 985 Baxter Avenue, Louisville, Ky.

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FOR SALE. Two new 32 x 4 tire protectors, two second hand tire protectors 34 x 4. Wight Optical Co., Northampton, Mass.

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small sand blisters which mean big blow-outs.
Write for particulars to the
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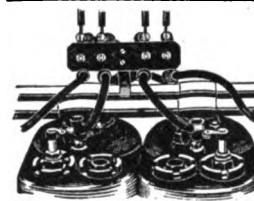
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Guaranteed for Life
All Sizes 14 Cylinder. Write for particulars.
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AND
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IT SAVES TIRES
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TIRE SAVING CO.
RACINE
WIS.

Buckles on like your skates, no tools, no fussing, no cussing.
Stops Skidding and Punctures, is Dirt Proof, Cheap Mileage and a
Proven Economy.

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Remove your Carbon by the Dry Powder Cleaning Process. It is now used by the United States Navy, we understand, for cleaning marine engines. The Flash Manufacturing Company, of Zanesville, Ohio, will send their literature and a sample package of their "Flash Decarbonizer" free of charge to anyone interested, who will take the trouble to write for it.

The Wood-Knight-Hawk Company has recently been incorporated at \$200,000. The new corporation will build the Pioneer Motor Car in connection with a new design motor plow. The Pioneer Car is light, strong and durable, being constructed of high grade material. It is the intention of the company to enlarge its plant owing to room required for making plows and trucks in addition to the Pioneer Car.

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GASOLINE LIGHTING SYSTEM
Draws Trade to Your Shop.
Gives a 300 Candle Power Shadowless Light the instant you move the lever. Turns up or down, like gas, burns dim when not in use, or can be turned up instantly when more light is needed. It floods a 30 foot space with a brilliancy like daylight. Far cheaper than gas, kerosene or electricity, and so simple that anyone can use it. You can depend on it for years for any purpose demanding a big, strong light. Catalogue A.B.R. tells why: Send for it now.
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182 N. State Street (Dept. 28), Chicago, Ill.

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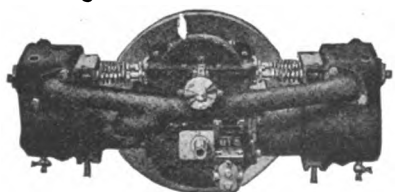
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28x3 1/2	3.30	34x4	4.75	34x5	6.30
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31x3 1/2	3.45	36x4	4.95	36x5	6.60
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Are made of three and four ply 19 ounce tire fabric, vulcanized in shape to lay on the inside of the casing, extended clear around to strengthen same. Can either be cemented in or laid in loose and makes the tire difficult to puncture, also reinforces weak casings. Packed neatly one in a box.



MILLER'S NEW STEAM TUBE VULCANIZER.



The above is a new steam tube vulcanizer that we are just placing on the market. It is especially adapted for repairing automobile inner tubes. Has a machine surface 5x19 inches, and will repair two tubes at one time. The steam is generated from a common blow torch flame, which passes through a flue 20 inches in length, giving heat surface sufficient to generate 40 pounds of steam in ten minutes. It is furnished complete by us, with pop valve, steam gauge, 2 clamps, base and gasoline blow torch for \$15.00; without blow torch, \$12.50. Jobbers who wish to catalog same, write for cuts.

CHARLES E. MILLER, Anderson, Ind.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Miller's Circular Lock Patch.

Is made of heavy tire cloth vulcanized to encircle the inner tube and formed to the natural shape of the inside of a tire. By encircling the inner tube you get much greater efficiency than it is possible to get by laying the patch over a hole in the casing. You can also use this patch for a rim cut as there is a thin edge which can be brought around under the tire, giving great strength at this point.

PRICES.

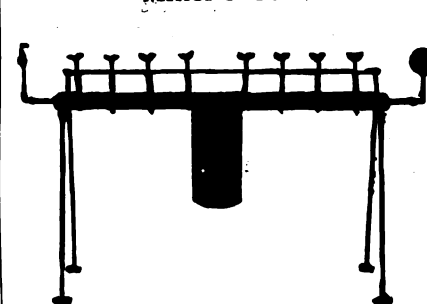
2 1/2 inches, each \$0.78 | 3 1/2 inches, each \$1.08 | 4 1/2 inches, each \$1.38
3 " " .90 | 4 " " 1.20 | 5 " " 1.50

Miller's Inner Tube Patches and Valve Seats.

Made of good grade rubber and in all sizes. Where extra large quantities are ordered can put the customer's name on patch.

Price, \$2.50 per Pound.

Miller's Inner Tube Vulcanizer.

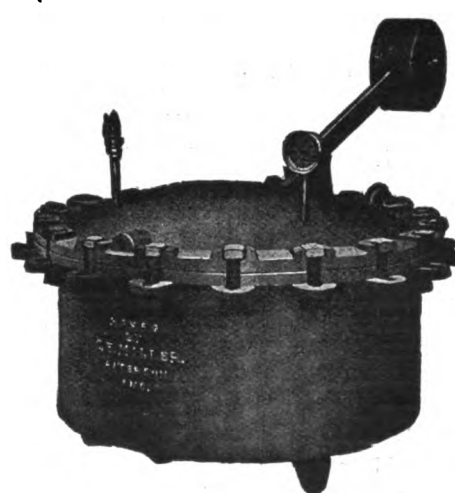


Has a tube plate 54 in. long and 4 in. wide with plain surface highly polished, complete with stand, 12 flue boiler, gas burner, water glass, pop valve, steam gauge, 8 clamps and two molds for curing the treads of casings, price \$25.00; gasoline burner \$2.50 extra. Tube plate only with steam

gauge and 6 clamps, price \$10.00.

We also manufacture various other vulcanizers. No. 1 and No. 2 adjustable sectional vulcanizers, complete with boiler, \$35.00 each. Bicycle vulcanizers, \$7.50; Motor cycle vulcanizers, \$12.50; Tread Rollers, \$12.00; Kettles, \$115.00; Power wrapping machines, \$175.00 each. We do all kinds of tire repairing and carry a large stock of tires at reasonable prices. If further interested in vulcanizers write for catalog and special proposition.

MILLER'S KETTLE VULCANIZER.



This kettle vulcanizer is made in two sizes; small size weighs 2000 lbs., holds from 5 to 8 tires at one time, up to 38 inches. Price, \$115.

Large size weighs 2500 lbs., holds from 7 to 10 tires at one time, up to 44 inches. Price, \$150.

If you are interested in other styles of vulcanizers write today for our catalog, showing 27 different kinds we make. We also manufacture a full line of repair materials.

Write for samples and prices. They are interesting.



BADGER SPRING BUMPER

The reason there are not more Bumpers used is that owners object to the changing of the spring hanger bolt and drilling numerous holes in the frame. To attach our Bumper, drill one 5/16 in. hole in the end of side bar and fasten as shown in cut, which can be done in ten minutes, and will fit any car.

In case of an accident, a thrust is against the point of greatest resistance. The springs are oil tempered and of our own design, brackets of cast steel, bar of selected one and one-quarter inch steel tubing, brass covered.

WRITE FOR CATALOG TO-DAY.

AUTO PARTS MFG. CO., 163 Michigan St., Milwaukee, Wis.

Some of Our Specialties

WE MANUFACTURE

Wind Shields,

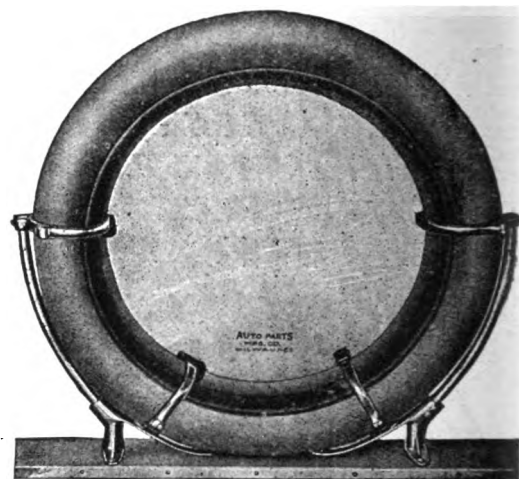
**Gasolene
Vulcanizers,**

Safety Grips,

Foot Rails,

Foot Pedals,

Symphony Horns.



BADGER TIRE HOLDER

The Tire Holders can be bolted to the running board of the car, obviating the necessity of boring into the body.

They will hold one or two, three and one-half to five inch tires, and can be equipped with chain and padlock instead of straps if desired.

Saves You Money—Doubles the Life of Your Tires

Keeps Your Tires Hard—Makes Them Wear Longer

INFLATE YOUR TIRES PROPERLY—pump them up to the same pressure—don't have a "softer tire" and let that tire be subjected to unnecessary wear and tear. By means of the

Trojan Tire Pump

**"The One Right Way
To Pump Up Tires"**

you can inflate all your tires to exactly the same pressure—the automatic indicator makes this result absolutely certain and, what is more, you can see it yourself. By pumping your tires with the Trojan you can actually make the cost of the pump by the amount you save in tires—and in a very short while. The Trojan is

Unlike Any Other Tire Pump

and, because of its extreme simplicity and few parts, is sold for less than any pump on the market. Is powerful—will pump up a 36x4½ inch tire in 3 minutes. Is portable—can be moved anywhere—while all the power needed to operate it can be obtained from an ordinary electric light socket. Is perfectly simple—easy to understand and absolutely guaranteed to be dependable—takes up little room and when not in use can be put in an out-of-the-way place. Made in two sizes; the one-cylinder for private use, \$75 for direct current and \$85 for alternating current; the two-cylinder for garages, \$140 direct and \$150 alternating current.

Write for Leaflet—"The One Right Way to Pump Your Tires." It gives full information and prices.

DEALERS: Write for Selling Rights. We have a few choice territories open for live dealers.

DAL MANUFACTURING COMPANY

116 E. 24th Street : : : Chicago, Ill.

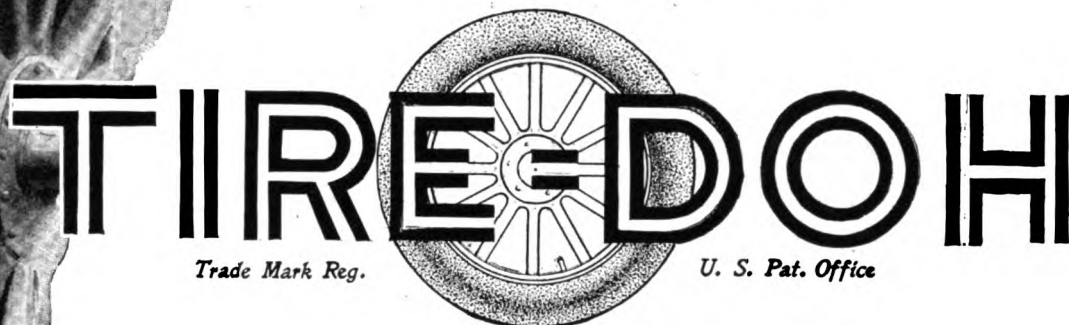
IS PORTABLE

—You can take a TROJAN to the CAR—you don't have to take the CAR to the PUMP.



Attach to an ordinary electric light socket—set the automatic indicator—turn on the current—that's all there is to it. No trouble—no work—and exact pressure on all your tires.

You can permanently repair
the worst blowout with just
your two hands and



You can do it anywhere—in the shop or on the road—
absolutely without vulcanizing and at one-tenth its cost. Money
back if you ask it is our guaranty. With Tire-Doh you can
repair *every injury* that can happen to a *tube or casing*—easier,
quicker and better than by vulcanizing and

You can save nine-tenths of your tire repair expense

The illustration below shows the
simple Tire-Doh Outfit — one
can of Tire Doh, one can of
Tire-Doh Cement and an in-
side Casing Patch, all neatly
packed in white enameled can.

To repair a puncture, clean
around the hole with gasoline,
apply Tire-Doh Cement, al-
lowing it to dry 5 to 10 min-
utes, and knead in enough

Tire-Doh to fill the hole and
make a neat patch. Time
required, 15 minutes, and
no vulcanizing required.

It is used in exactly the
same manner for blow-
outs or for repairing
cuts and sand-pockets
in casings, and no mat-
ter how large the
hole, Tire-Doh will
make a permanent
repair as tough and
elastic as the tire
itself.

Remember our guaranty of money back in full any time you would
rather have it. Tire-Doh must do what we claim for it or we would
have been out of business long ago. It's a fact that over 30,000 Tire-Doh
Outfits have been sold to date on that basis and only 22 purchasers asked
for money back. They got it promptly; and we make the same propo-
sition to you now. If you care what it costs you to keep your tires run-
ning, if you want the best insurance against delay on the road, forget
your doubts and

Try Tire-Doh at Our Risk

There are no strings or conditions to our money back offer. We will
simply send you a check or your dealer will refund your money if you
ask for it.

Your dealer probably carries Tire-Doh. Ask him. If not he will
be glad to get you an outfit immediately. Or we will send you
one express prepaid upon receipt of your check or money
order for \$2. To be sure you will not forget it—

Tear off this Coupon NOW
as a reminder to get a
Tire-Doh Outfit

ATLAS AUTO SUPPLY CO.

77 East Adams Street,
CHICAGO, ILL.

ATLAS AUTO SUPPLY CO., 77 East Adams Street, Chicago, Ill.
For this \$2 send me a TIRE-DOH OUTFIT upon condition that
you will return my money in full upon request.

Name _____
Address _____
My Dealer's Name _____



TIRE-DOH OUTFIT, PRICE \$2

"AS SIMPLE AS A B C" TO MEND YOUR TIRES

—WITH—

FIX TIRE

Cures Crippled Casings and Tubes.

Your Thumb Does The Work.

The simplest, easiest, quickest remedy for blowouts and punctures. No vulcanizing necessary, no heating, no tools. You can make a complete and permanent repair yourself.

ALL YOU HAVE TO DO :

A Clean the cut with gasoline.

B Apply FIX TIRE Cement and let it dry from five to ten minutes.

C Knead in FIX TIRE, which becomes part of the casing or tube, just as durable and resilient as the rest of it.

When puncture or blowout comes to you miles from home you'll "thank your lucky stars" that you had FIX TIRE in your tool kit.



As an Antidote: When abrasions and cuts appear on your casings, don't let them grow large, use FIX TIRE at once and forestall blowouts. **You can get more mileage out of your tires by the judicious use of FIX TIRE.**

\$2.00 a Can.

It must satisfy you, or your money back. Read the coupon, then clip and mail it to us.

DEALERS.

We've a special dealers' proposition which will interest you. We'll send it on request.

**Motor Accessories Makers, Inc.,
84 Jackson Blvd., Chicago, Illinois.**

For the \$2.00 enclosed send me a can of **FIX TIRE**. If not satisfactory in every particular you will refund the money.

P. O. _____

**MOTOR ACCESSORIES
MAKERS, Inc.,**

**84 Jackson Boulevard,
CHICAGO, ILL.**

Goodyear Protection Patches Will Get the Car Home

A cut clear through the outer casing—20 miles from home. That predicament can be easily overcome. Always carry Goodyear Protection Patches—and tire worries are gone.



There is no longer any need to run home on a flat tire, after a blowout in your last spare casing, for that means a new tire next day.

Because that emergency may arise any time, always carry Goodyear Protection Patches.

An outside boot fits firmly over the casing and laces over the rim with a thong. This protects the tire. No dirt can work into the cut.

An inside patch fits snugly inside the casing. This prevents damage to the fabric and prevents pinching the tube.

This way a car can run many miles. Note how snugly the patches fit, so there is no danger of recurrence of this tire difficulty.

Goodyear Protection Patches possess wide popularity amongst automobile owners. There is a strong demand for them.

OTHER
GOOD YEAR
ACCESSORIES



Inside Tire Protectors, Rim Cut Patches, Self Cure Repair Outfits, Lever Handle Grips, Inner Tube Bags, Quick Repair Gum and other accessories.

Dealers, Repair Men, Garage Men find that Goodyear accessories are producers of bigger business than any other line. This is due to the absolute satisfaction given by every article and by our tremendous advertising campaigns which have made these accessories known to every driver of an automobile. Write today to

The Goodyear Tire & Rubber Company

Sprague Street, AKRON, OHIO

Branches and Agencies in All the Principal Cities

Put an EXO on your car for 30 days' free trial

Among the thousands of EXO signals we have shipped to car owners all over the country, offering to return their money if not satisfied, there has not been one case in 500 in which the signal has been returned.

Our willingness to have you test the instrument shows our complete confidence in this inexpensive but powerful signal. We extend the offer to you—"Try it 30 days and if not satisfied return and we will refund your money."

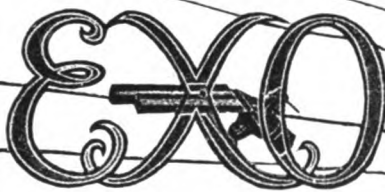
No matter if your car is equipped with a horn—it still remains that you need an EXO, the signal that operates from the exhaust of the engine, that cannot clog up nor get out of order.

EXO is commanding but not descendant—loud enough to be heard a mile, if necessary, or can be reduced in volume of sound for use in the city.

The first cost of EXO is the last. Once upon your car it requires no further atten-

tion and no further expense. It fits the exhaust pipe of any car and requires no threading.

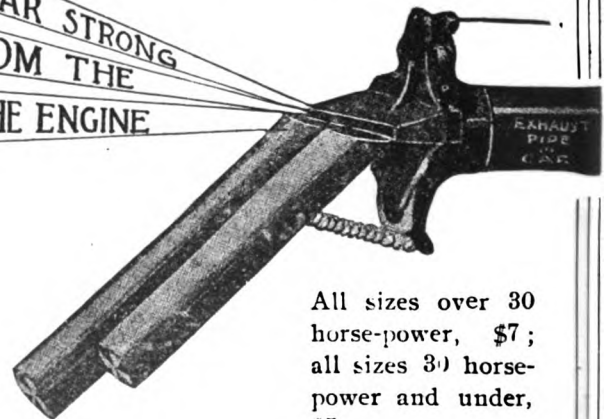
You simply clamp it on, and it is ready to operate.



MAKES A CLEAR STRONG
SIGNAL FROM THE
EXHAUST OF THE ENGINE

Ask your dealer for EXO. If he does not carry it or is not inclined to get it for you, then order direct from us and we will ship the day the order is received, express prepaid. Give make, model and year of car in ordering.

Prices include foot pedal, cable, etc., all ready to attach.



All sizes over 30 horse-power, \$7; all sizes 30 horse-power and under, \$5.

TROY AUTO SPECIALTY CO., Troy, N. Y.
Gentlemen—
Enclosed find \$
for Make of Car
Year
Ship via express, prepaid, "EXO"
Model
If I am not satisfied after a trial of 30 days, I
may return the signal and you will refund
my money.

**TROY AUTO
SPECIALTY CO.**

TROY, NEW YORK

The Time to Lubricate With



is from **NOW=ON!** *NOT* at some future time when the repair man finds re-building is your car's last hope!

ONE FACT guarantees the wear-preventing qualities and the economy of **NON-FLUID OIL**:—

It is used and recommended by over seventy manufacturers of motor cars!



FREE TO EVERY CAR OWNER

We have prepared a Chart for Steering Clear of Motor Troubles, and will send a copy, free, to every motorist who fills out and returns the attached Coupon. If you will mention your dealer, we will enter your name on our list to receive copy, also, of fully illustrated treatise on "Motor Car Lubrication," just off the press.

NEW YORK & NEW JERSEY LUBRICANT CO.

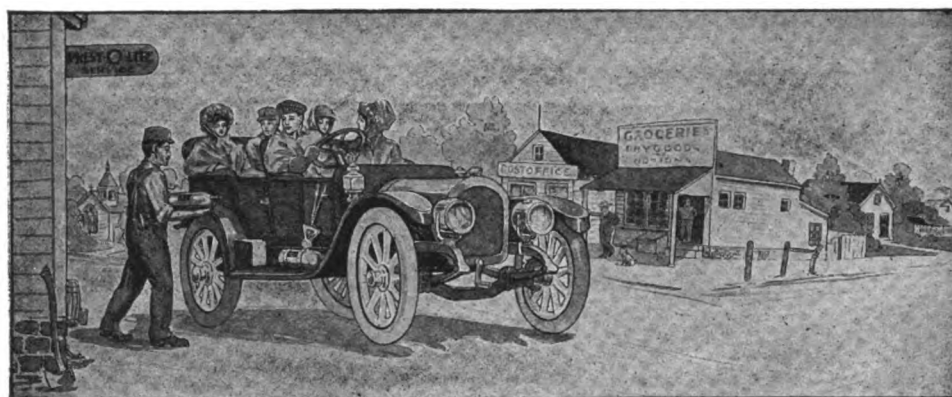
165 Broadway, New York

UNITED MANUFACTURERS, DISTRIBUTORS
250 West 54th St., N. Y.

SEND THIS COUPON FOR OUR LUBRICATING CHART

Name.....
Address.....
Car.....
Dealer's name.....
Address.....
I am now using.....
for bearings and gears.
A. D. & R. I.

Please mention the Automobile Dealer and Repairer when writing to advertisers.



Where Will You Be When Your Gas Tank Runs Dry?

This is a serious matter, if you have a tank not backed by a widespread exchange service. Any man who has found himself 30 miles from a city at night settled down, with an empty tank that could not be exchanged, will advise you not to buy such a tank. But the Prest-O-Lite user knows no such trouble.

PREST-O-LITE GAS TANKS

When Empty Can Be Readily Exchanged Anywhere and Always

There are Prest-O-Lite Exchange Agencies in all cities, and in nearly every town and small village in the United States.

No imitation has, or ever has had, a dependable exchange service.

Be careful to see that no such tank is put on your car in exchange for your empty Prest-O-Lite, either through open persuasion or secret substitution.

Prest-O-Lite has had dozens of imitators. One by one they have gone out of business. Here are the reasons:

- 1st.—Not one of them ever made good the claims of "more gas" or "better gas" than Prest-O-Lite.
- 2d.—Not one of them ever furnished a reliable, widespread exchange service.
- 3d.—Not one of them ever satisfied its customers or attracted enough customers to enable it to stay in the gas tank business.

Every one of these imitators, on quitting the business, left the dealer and his customers "holding the sack" with tanks that could neither be sold nor refilled.

Don't gamble on what any imitator promises, claims or hopes to do. The lesson of the past is eloquent. Let the imitator experiment with his own money, not with yours.

The Prest-O-Lite Co., 251 East South St.,
INDIANAPOLIS, IND.

BRANCHES AT: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Jacksonville, Kansas City, Los Angeles, Milwaukee, Minneapolis, New York, Omaha, Philadelphia, Pittsburg, Providence, St. Louis, St. Paul, San Francisco, Seattle.

CHARGING PLANTS: Atlanta, Cleveland, Dallas, E. Cambridge, Hawthorne, Indianapolis, Long Island City, Los Angeles, Oakland, Omaha, and Seattle.

FOREIGN AGENCIES: Honolulu, H. I.; Manila, P. I.; San Juan, P. R.; Toronto, Can.; Vancouver, B. C.; Havana, Cuba; City of Mexico; London, Eng.; Berlin, Germany.

EXCHANGE AGENCIES EVERYWHERE

TIRES. TUBES. TIRES.

STANDARD MAKES.

Highest grade stock, comprising of the best manufacturers. Cannot advertise names on account of the reduced prices we are selling them at.

Every tire is guaranteed brand new, perfect in every respect, and are not more than six months old. Some of these have the names of the makers on and others are buffed.

We thoroughly examine and test every tire and tube under heavy pressure to detect any weakness before shipping.

These are not the kind usually advertised. Nothing but the best stock is quoted in this ad.

Casings to fit Clinchers, Quick Detachable or Dunlop Straight Side Tires.

Size	Casing	Tube	Size	Casing	Tube
29x8	\$9.50	\$3.50	35x4	\$22.00	\$5.25
30x8	10.75	2.75	36x4	19.50	5.40
32x8	10.50	3.00	37x4	23.50	5.75
28x3 1/2	12.00	3.00	32x4 1/2	20.00	5.50
29x3 1/2	14.50	3.15	33x4 1/2	23.00	5.60
30x3 1/2	14.50	3.75	34x4 1/2	28.50	5.75
31x3 1/2	15.00	3.75	35x4 1/2	24.50	6.00
33x3 1/2	15.00	3.90	36x4 1/2	25.00	6.10
34x3 1/2	15.75	4.15	37x4 1/2	25.00	6.20
36x3 1/2	15.00	4.25	34x5	20.00	6.00
30x4	16.50	4.60	35x5	25.50	6.25
31x4	17.00	4.75	36x5	26.00	6.50
32x4	17.50	4.90	37x5	28.00	6.75
33x4	19.00	5.00	37x5 1/2	30.00	7.00
34x4	19.50	5.10			

Take advantage of these prices while they last, as we cannot guarantee how long these prices will stand good.

We guarantee these tires and tubes to be strictly 1910 and 1911 goods.

We are one of the oldest and largest tire and mail houses in the United States, and you do not have to hesitate to send us an order with cash accompanied, as we can refer you to any Commercial Agency or Bank in New York, as to our references.

We agree to refund your money if goods are found unsatisfactory upon receipt.

We Ship Goods Subject to Examination.

INSIDE TIRE PROTECTORS.



Prevent blow-outs, punctures, and greatly increase mileage. No need of throwing away old tires that are not worth repairing. Simply apply the inside tire protector and the old tire is given new life again and will add many miles of additional service. It covers the whole inside of casing to the head and is thus a blow-out patch extending all the way round. It is an acknowledged fact that 75% of all tires break down or blow out in the fabric before the rubber

is half worn out, thus losing half the mileage. These tire protectors are made from 3 to 6 ply of Egyptian fabric, with a self-seal flap reinforcing the rim and sides, always the weakest parts. We strongly advise placing these protectors in new tires, thus keeping them sound by releasing the strain, and the earlier a tire is equipped with them, the longer its life and the greater its mileage. Tube pinches are eliminated by the use of these protectors.

Order a complete set of them and save 100% on your tire expense.

Size	Reg. Price	Cut Price	Size	Reg. Price	Cut Price
28x2 1/2	\$4.65	\$2.40	35x4	\$7.00	\$4.90
28x3	4.75	2.60	36x4	7.75	5.00
30x3	4.90	2.85	32x4 1/2	7.25	5.00
30x3 1/2	5.25	3.85	34x4 1/2	7.50	5.10
32x3 1/2	5.50	3.55	35x4 1/2	7.60	5.25
34x3 1/2	5.75	3.95	36x4 1/2	8.00	5.50
30x4	6.20	3.75	34x5	8.10	5.60
31x4	6.25	4.00	35x5	8.25	5.75
32x4	6.40	4.20	36x5	8.50	6.00
33x4	6.60	4.40	37x5	9.00	6.50
34x4	6.75	4.75	37x5 1/2	9.25	6.75

Owing to the fact that our profits are very small, we sell for cash only, and under no circumstances otherwise.

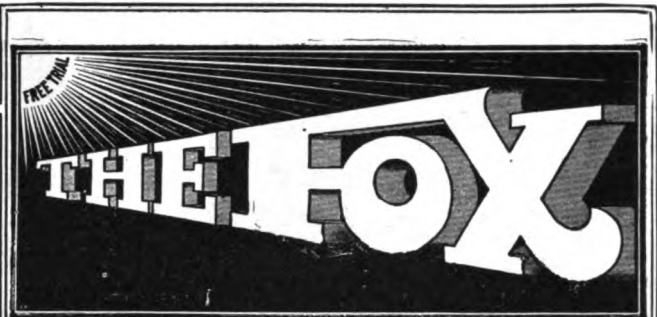
C. O. D. orders filled if 10% is accompanied with order, to show good faith.

Send for complete list.

EXCELSIOR TIRE CO.,

1777 Broadway,

New York City, N. Y.



TO AUTOMOBILE DEALERS AND REPAIRERS

If you knew positively that by the persistent and judicious use of a typewriter you could in 1911 double your last year's business you wouldn't hesitate an instant in purchasing one!

We have just issued a large illustrated book showing how the big city concerns have built up their immense businesses and shows how anyone in any class of business can increase that business by means of the typewriter. There are hundreds—yes, thousands—of persons in your territory who are interested in Automobiles, and Automobile Supplies and Repairs, and these parties are going to purchase somewhere. Why not send to-day for this book and let me show you how the typewriter will enable you to get this business? It is Free!

WRITE FOR BOOK
SHOWING HOW
YOU CAN

Double
Your Sales
WITH A
TYPEWRITER



THE FOX—"THE ONE PERFECT VISIBLE TYPEWRITER"—FOR 20 CENTS A DAY! Sent on FREE TRIAL to anyone—anywhere—at my expense—to be returned if not better than the best of other makes. If purchased you can pay me a little down after trial and the balance at the rate of 20 cents a day—no payments on Sundays and Holidays.

The Fox is Visible—you do not have to look beneath a lot of moving typebars to see what is written! It has a Back Space Key, Tabulator, Two Color Ribbon with Automatic Movement and Removable Spools, Interchangeable Carriages and Platens, Card Holder, Stencil Cutting Device and Variable Line Spacer with Line Lock and Key Release. Its Speed is fast enough for the speediest operator or slow enough for the beginner. It is extremely Durable and almost Noiseless.

Will You Do This Now? I want you to fill out the attached coupon and give me a chance to "show you"—at my expense—what I have. Remember, I belong to no trust—no combination—and no one tells me at what price I must sell nor on what terms I must sell.

SEND FOR MY CATALOG, ANYWAY!

Date.....191.....

W. R. FOX, President, Fox Typewriter Co.,
6606-6616 Front Street, Grand Rapids, Mich.

DEAR SIR:

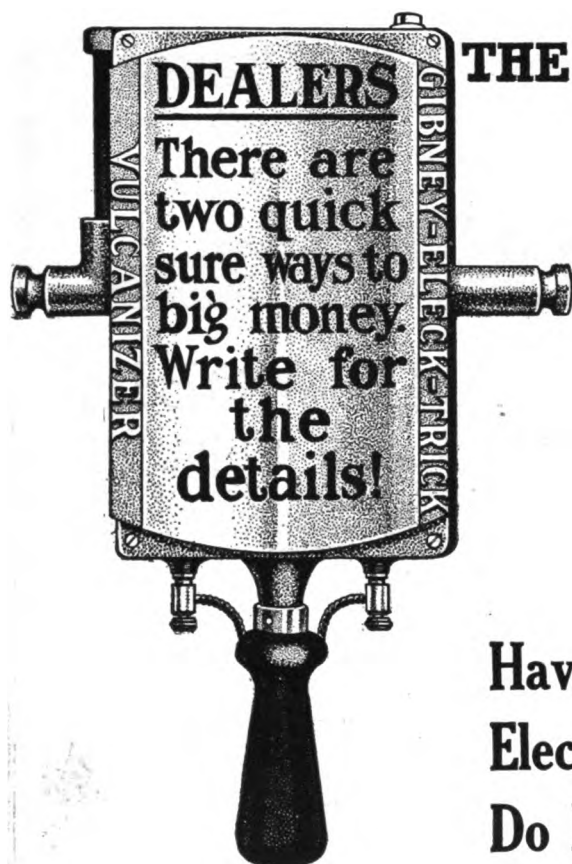
Please send me a copy of your catalog and write me full particulars concerning your "20 cents a day" payment plan on the new Fox Visible Typewriter. It is distinctly understood that the signing of this coupon does not in any way obligate me to purchase, and that no typewriter is to be sent me unless I decide later to order one for free trial.

Name.....

Address.....

Business.....

Please mention the Automobile Dealer and Repairer when writing to advertisers.



THE GIBNEY ELECK-TRICK Vulcanizer Proposition To You!

Have You Investigated the Gibney-Eleck-Trick Proposition? If Not, Do It To-day

HUNDREDS of dealers have responded to our advertising offering them an opportunity to earn a nice profit through the acceptance of our proposition regarding our vulcanizer.

We have a plan to submit to *you*, which you can put into operation and try out—one that will add a profitable line to your business—hundreds of dealers have proved it.

The Gibney-Eleck-Trick Vulcanizer is absolutely the best of its kind on this or any other market. It is a standard and well advertised device which is finding instant favor among dealers and car owners.

We want your co-operation and we offer in return not only our co-operation, but also money-making opportunities which you cannot afford to overlook.

This is a proposition which will be of interest to your trade—one which you need only glance over to understand, *and one which you may try without risking any money.*

If you have not yet investigated, then do so to-day, using the corner coupon. Your request will bring you full particulars.

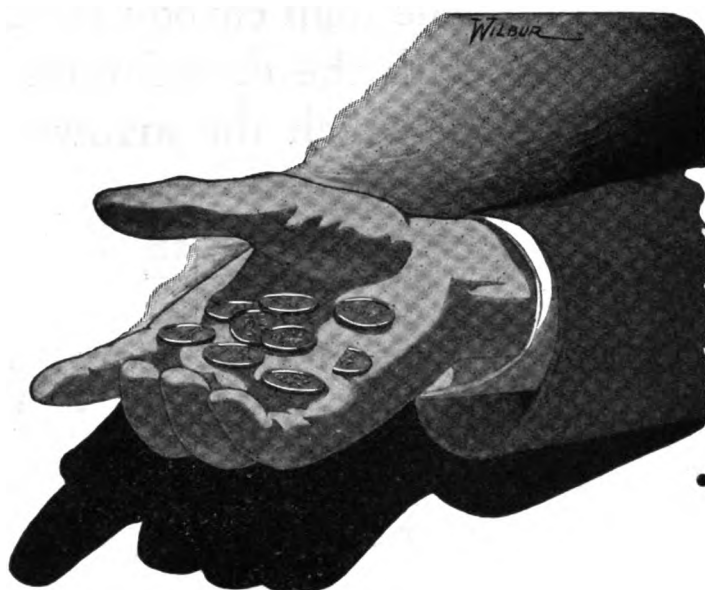
JAS. L. GIBNEY
& BROS.,
221 N. Broad St.,
Philadelphia, Pa.

Date.....
Please send me full details concerning your proposition.

JAMES L. GIBNEY & BRO.

221 N. Broad St., Philadelphia, Pa. 248 W. 54th St., New York, N. Y.

8½ cents a month
pays for the only
easy working,
98% efficient
tire pump—the



Pitner Pump

Price \$5 and *guaranteed* for five years' service means \$1 a year—8½ cents a month. It can't cost you more.

How much will any other tire pump cost you *by the month*? How long will any other tire pump *last* and *satisfy* you by doing its work *well*? Nobody knows well enough to guarantee it—or maybe they know *too* well. Anyway, the Pitner is the *only* pump that is *guaranteed* for five years' service.

8½ cents a month. That is *all* it costs to be *sure* you'll *never* have to run on a flat tire—if you carry a Pitner Pump. And you can't be sure with *any other* pump. The Pitner is the *only means* of inflating

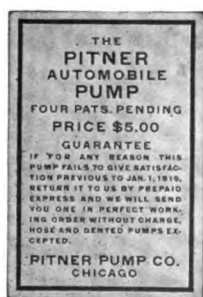
tires that is *always dependable* any time and any place—the *only* tire pump *guaranteed* for five years' service.

8½ cents a month is pretty cheap tire insurance. Read our guaranty plate attached to every pump.

Some day on the road you may pay dearly, in tires, for *want* of a dependable pump—unless you clip the coupon below as a *reminder* to see your dealer about the Pitner Pump. For *quick action telephone* him now. Then if he can't supply you, send us his name and \$5 and *we* will ship you a Pitner Pump *express prepaid*. Money back if you ask it. So

Clip this coupon NOW

The Pitner Guarantee



Here is a photograph of our guarantee and name plate attached to every pump. Two or three times a year we change the date on it so that every purchaser is guaranteed satisfaction for full 5 years.

Pitner Pump Co., 18 W. Michigan St., Chicago
Gentlemen:—My dealer whose name and address are

Dealer's Name.....

Dealer's Address.....

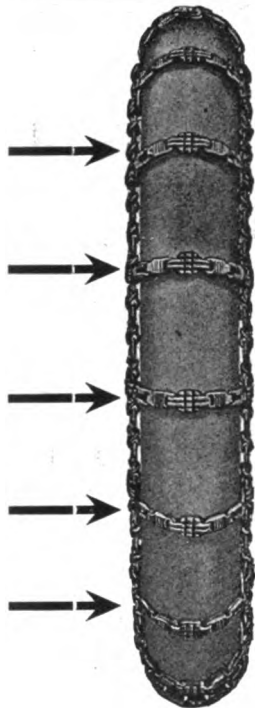
says he is not prepared to deliver me a Pitner Pump. For the enclosed \$5.00 { draft check money order } please ship me one express prepaid upon condition that you will return my money in full if pump is returned to you within 15 days from this date.

My Name.....

My Address.....

If before ordering you want our interesting free booklet that explains all pumps, just send us this coupon without the \$5.00.

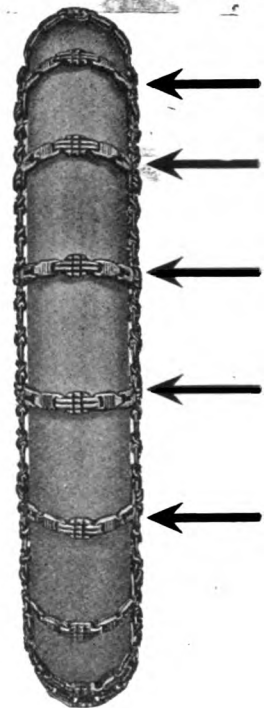
Pitner Pump Co., 18 West Michigan St., Chicago, Ill.



The high carbon steel cross chains with the drop-forged center link, to which the arrows point, make

Atlas Chains

three times more durable than ordinary chains—and they won't make a meal off your tires. We want to send you one of these cross chains Free—and let you do your own experimenting.



Since advertising to car owners to let them test this important part of the chain, we have found that many thousands of them are "from Missouri." They have sent their requests and are now trying the experiment.

In case *you* have overlooked our previous advertising covering this free offer, we again present it in brief:

We will send you upon request, charges prepaid, a cross member of the Atlas Chain.

Upon its receipt we ask you to snap it upon the ordinary chain you are now using and let it work along with the ordinary links.

The point we want you to prove for yourself is that after the ordinary members have disintegrated and broken apart the Atlas cross member will scarcely show signs of wear.

If you wish to continue the experiment, place the same cross member on your next new chain and when *that* chain has worn out place this same cross member upon the *third* chain.

This is our proposition to you to demonstrate the established fact that one set of Atlas Chains will outwear three sets of ordinary chains.

We run no risk in asking you to make the test our expense. We have the goods.

The center link of the Atlas cross member is made of high carbon steel drop forged—the cross members themselves are made of high carbon steel, all subjected to two hardening processes.

You will notice another most important feature when this cross member we propose to send you arrives, and that is that the inner or tire surface is smooth as glass and absolutely devoid of any sharp edges which could cut or abrade the tire.

This is the whole story and it is up to you to investigate it, and your investigation will cost you nothing.

If you want to try this experiment write to-day. A postal card will bring you a cross member—then form your own conclusions.

Atlas Chain Co.

BUSH TERMINAL NO. 4

BROOKLYN, N. Y.

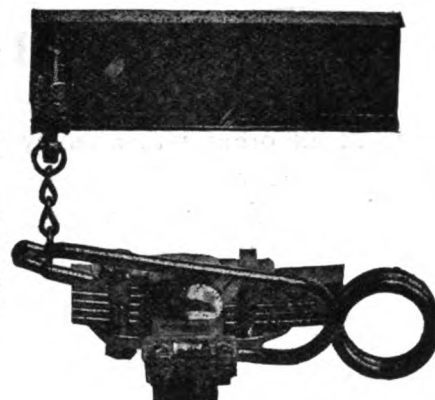
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Ideal Shock Absorber

Stops upthrow. Others claim to. We do it, by stopping on the strength of springs. There is no sudden stop. They stop vibration, making a 4-cylinder car ride with the steady, gliding motion of a 6-cylinder. They make a car ride steady and without upthrow the same with light load as when fully loaded. It is the tension put on our spring that gives these results. We do not let the upthrow get a start. When load goes down below normal road spring, they work in opposite manner and help to sustain the load. No bumpers needed. No owner can afford to buy a car and let it shake itself to pieces. They pay for themselves shortly by saving tire, engine and battery troubles, besides added comfort. We make a special hanger and attach these to the Model T Ford. Easily attached. Our goods by use will sustain every claim.

Agents and Jobbers Wanted.

THOMAS AUXILIARY SPRING WORKS, Canisteo, N. Y.



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MAPS AND GUIDES FOR AUTOMOBILISTS.

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TUTHILL SPRINGS for Automobiles THE BEST MADE.

TWO GRADES, (1st) Standard, made of finest high carbon Automobile steel; (2nd) Special, made of Vanadium Alloy steel.

We are experts in designing automobile springs.



If you have any trouble with your springs send to us. We have large capacity and can make quick delivery.

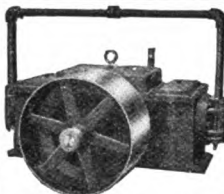
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Several sizes and styles especially for garage work. Simple and reliable. Hundreds in use.

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Mechanicsburg, Pa.

ALUMINUM SOLDER THAT WILL SOLDER

Directions simple and easy to follow. Write for prices.

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—GET THE—

Superior Double Spark Plug

PRICE, \$1.50

SUPERIOR MOTOR SPECIALTY COMPANY

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Improved Shippey Shock Absorber

prevents springs from breaking and gives comfortable riding. It has a perfect record of satisfactory use.

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LAST A LIFETIME



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PERFECT MANUFACTURING CO.

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Sampson 35 Brush Delivery
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61st St. and Broadway
New York City

DURYEA BUGGYAUTS.



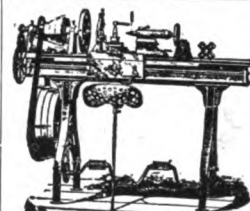
If you are tired of troubles, delays, rattles and repair bills, investigate these simple cars.

Their simplicity and power will astonish you.

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9' swing
11' swing
13' swing

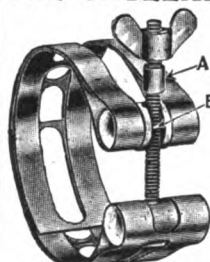
For Repair Work our No. 13 Lathe is right; has 13' swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with counter-shaft or foot-power.

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Nothing has ever been created in this line comparable with it. This clamp can be attached or detached in a few seconds. It cannot slip, loosen, or cut the hose, and its strength, owing to its construction of band metal, and the way the ends are overlapped, is simply a perfect clamp, and the price is very low. Let us tell you more about it, if you are an automobile manufacturer or dealer, let us send you one for inspection.

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\$60 Lathe, Gap-Lathes, Turret Engine Lathes and Shapers, Screw Cutting, Foot and Power Lathes, Hand and Power Planers, Hand and Power Drills, Chucks, Emery Wheels, Outfits, Tools especially for Blacksmiths, Electricians and Bicycle work. Catalogue Free.

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QUICK DETACHABLE

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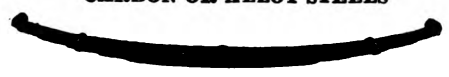
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All our work **guaranteed**.

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Give a **hotter spark** than any other plug made and therefore explode a **thinner mixture** of gas. Therefore **more power** and **less carbon**.

Bear these points in mind and insist upon no other in your motor equipment.

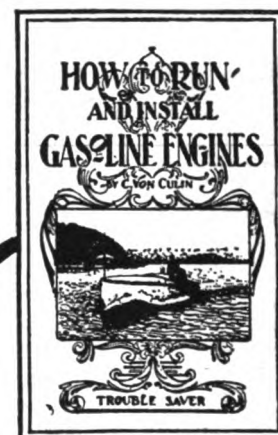
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Booklet and descriptive matter for the asking.

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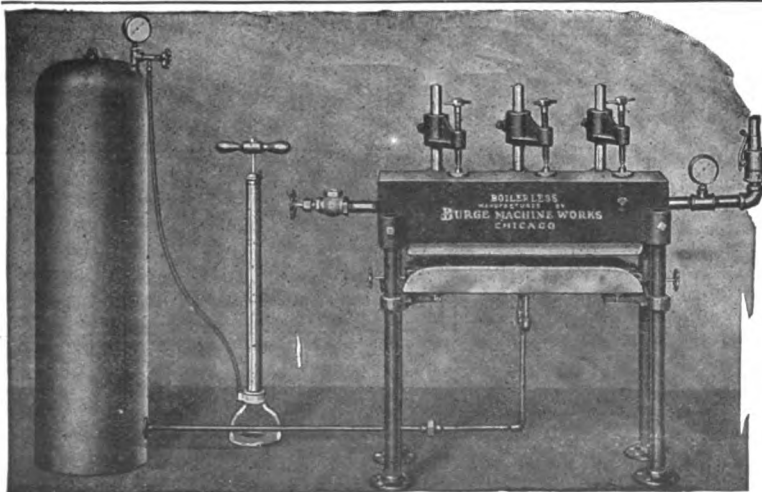


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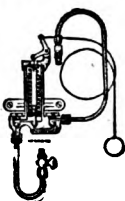
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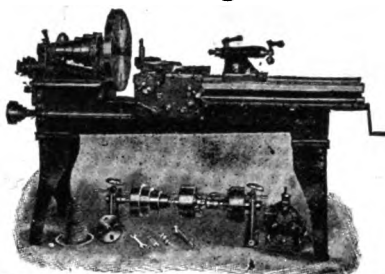
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This Lathe swings 18 1/4 in. over top bed, 23 1/4 in. thru gap, and the gap opens 18 in. wide.

The 5 1/4 ft. bed takes up to 64 in. between centers, while our 7 1/4 ft. machine takes 96 in. between centers when extended.

Just the thing for garage and repair work, and saves investing in a large expensive lathe.

The machine is built strong, rigid and accurate, and has all necessary accessories as shown.

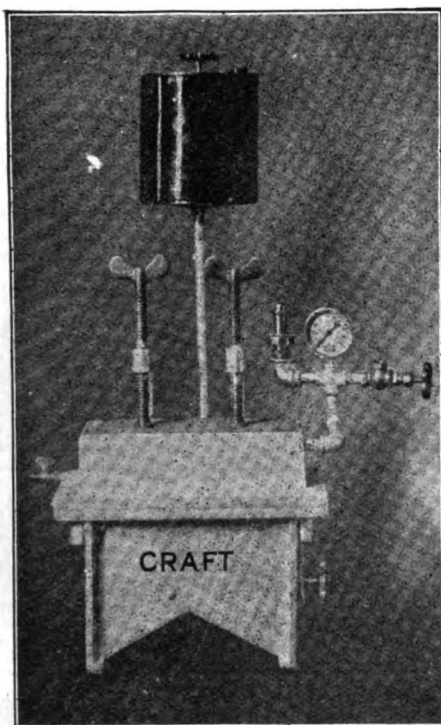
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CRAFT Steam Inner Tube Vulcanizer



Two tubes every fifteen minutes and no danger of burning them up. Any break-up to the length of eleven inches in one cure. This machine will do all the tube work in any garage in the United States. Fitted to use with gas or gasoline and sold for \$25.00, cash, with your order. This vulcanizer is not sold through any dealer or jobber in the U. S., but sold from the makers only.

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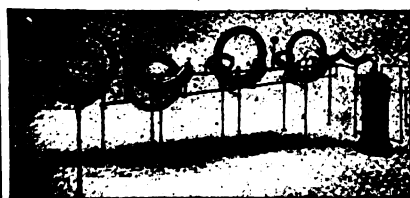
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GETS AT THE HEART OF THE PUMP QUESTION



IT is a joy to keep your tires inflated if you use the Hawthorne Four Cylinder Pump.

Why ruin your tires by running flat?

It is so easy to pump them up now. You'll save money with the Hawthorne Pump, by making your tires last longer.



Easily attached to running board, and with the six feet of tubing attached any tire can be quickly reached and inflated.

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NORWOOD 3-in-1 VEHICLE GASTER JACK AND JACK ON WHEELS.



Pat. June 25, 1907; Oct. 25, 1910.

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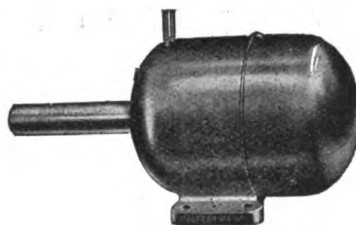
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Makes the best lighting system extant for Automobiles and Motor Boats. No relays or measuring instruments necessary. Just the dynamo and battery. Easy to install.

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FLASH GOES IN—CARBON GOES OUT

For your own satisfaction, we want you to try one can of this Celebrated Cylinder Cleansing Compound. Sold by Automobile Supply Dealers generally throughout the world, or by mail for \$1, postpaid.

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CAN BE EQUIPPED WITH

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Oily Waste Cans, meeting insurance requirements.

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Kamp Kook's Kits that please tourists.

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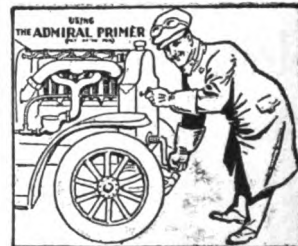
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Every car owner should have one and every dealer and repairman should carry them in stock.

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WINDSHIELD
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With this, CAST IRON or STEEL of any size can be brazed by Brazing Torch or in a Blacksmith's Fire.

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represents the foremost advance in ignition. The simplicity and ease with which this Spark System is installed is one of its most commendable features. (A screwdriver and pliers are the only tools required.)

While this system depends on dry cells for its operation, do not compare it with any other battery system. Six cells will carry you 2,000 to 4,000 miles and over without replacement of batteries. This marvelous battery economy is due to the fact that the ordinary battery and coil system eats up a large portion of current in the opening of the circuit, which is accomplished by magnetic means. The Rhoades' Unit Spark System is mechanically operated and therefore requires no timer vibrating coils, delicate relays, etc.

An intensely hot igniting spark is furnished whether the engine is running one revolution or 200. Impossible to stop in contact and a button is provided for starting on the spark.

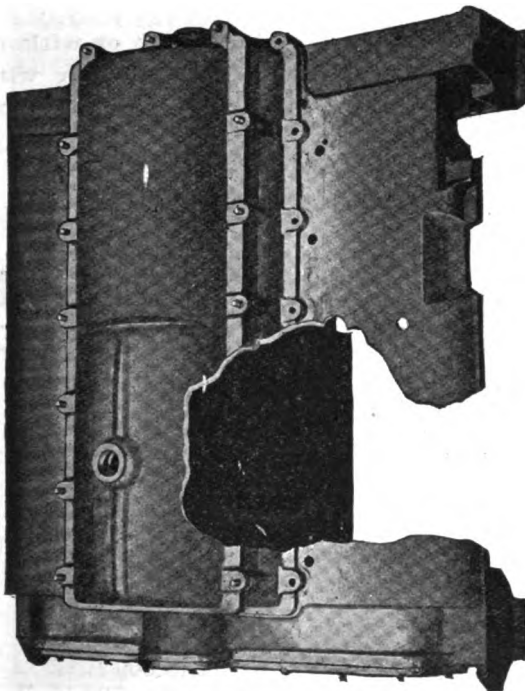
SPECIAL ATTACHMENT FOR FORD CARS. CATALOGUE ON REQUEST.

In writing state make of car, size of time shaft, direction of same, and number of cylinders.

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We make a specialty in welding cracked cylinders and water jackets, crank cases, gear cases, of cast-iron, malleable iron and aluminum.

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Quite often the customer can wait for and see how it is done.

We make no secret of our process and let the customer see it if he wants to.

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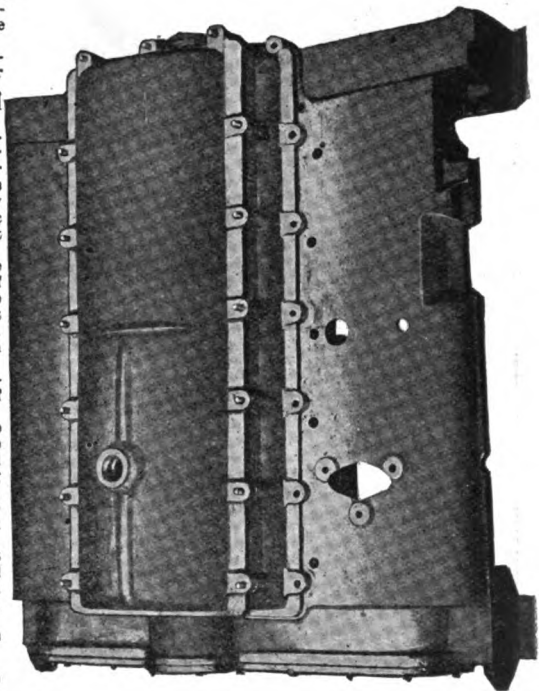
Nothing too small nor too large of what we could or would not be able to take care of.

Our works are so located that they can be reached by water, rail and roads. Automobiles can drive in our yards and leave cars, till repairs are done.

Quite often, we do the repairs without dismantling the cars.

TRY US AND BE CONVINCED

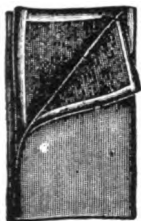
Write for estimates and interesting printed matter.



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STAMFORD, CONNECTICUT.**



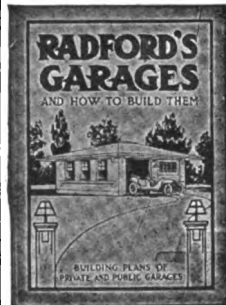
Fire Proof Auto Robes

Fire, water and moth proof—Manaline—greatest production of the age. 30 oz. Wool Kersey Back, Manaline facing.

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Terms—No. 1, Check with order.
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Every Auto owner is vitally interested in the subject of where to keep his machine. The most convenient place is on your own property in a private garage the architecture of which is in keeping with your house.

This book is the only one of its kind and shows a standard collection of New, Original and Artistic Designs for Up-to-date Private and Public Garages adapted to Frame, Brick, Stone, Cement, Stucco, or Concrete Construction, together with Estimates of Cost.

55 DESIGNS OF GARAGES 55

are shown by perspective views and floor plans giving dimensions, etc. Also remarks on **GARAGE CONSTRUCTION** explaining the advantages of each form of construction and giving details about the manner of erection, selection of materials, hints on supervision, etc., etc.

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Also Grout, Prescott, Locomobile and Mobile Boilers all guaranteed to fit. Special boilers 4 to 60 h. p.; repair work.
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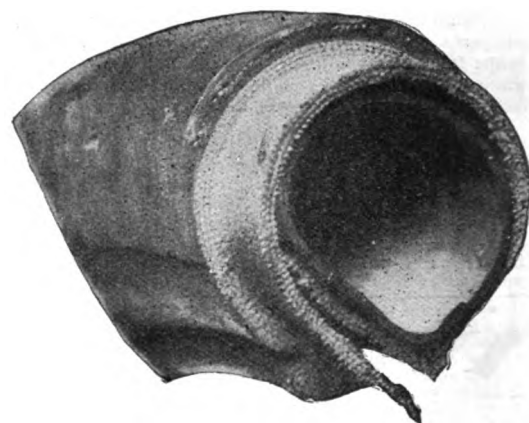
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AND OTHER SPECIALTIES. NEW PRICES.



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FOR REPAIR WORK,
BICYCLE AND
MOTOR CYCLE
TIRES,
MECHANICAL
RUBBER GOODS,
STEAM BOILERS,
REPAIR
VULCANIZERS,
KETTLE
VULCANIZERS.



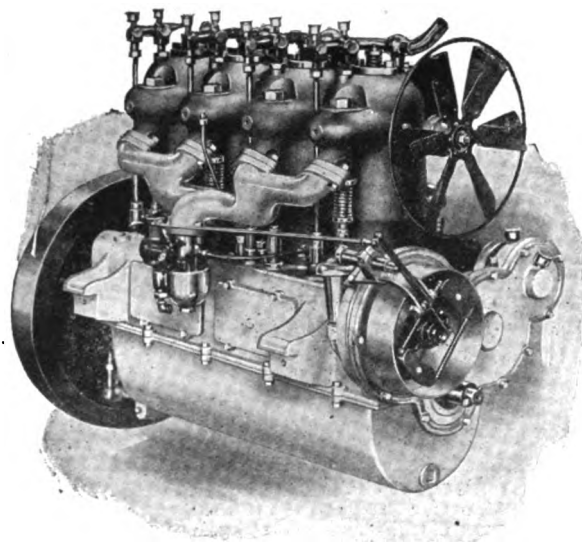
We make Inner Liners with or without the Interlocking Flap, Endless or with the two ends. Any weight fabric or number of plies.

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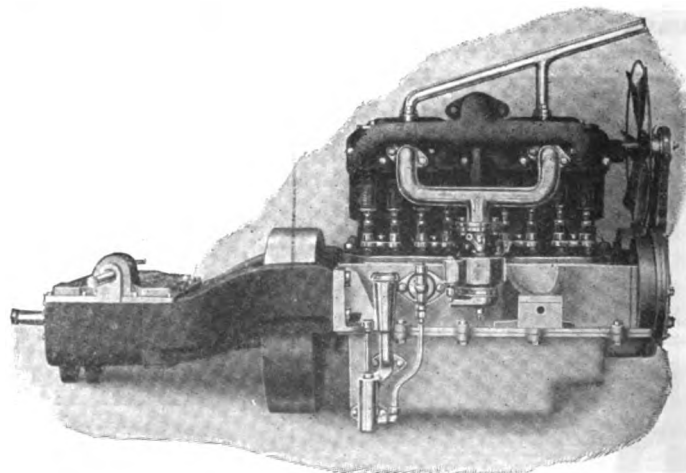
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Really, what does the mileage guarantee amount to?

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28x3	\$11.50	\$3.00
30x3	12.40	3.30
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30x3½	17.25	4.45
32x3½	18.50	4.70
34x3½	20.00	5.00
36x3½	23.00	5.25
30x4	24.00	5.75
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36x4	28.30	6.50
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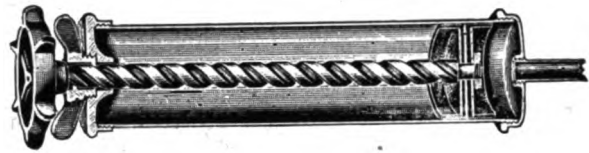
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PATENTED FEB. 7th, 1911

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CEDAR FALLS, IOWA



USERS of our
Tire Protectors
and Emergency
Patches say:

**"ONCE ON,
THEY ARE
THERE TO
STAY."**

**And There Are
Reasons A MAN-
UFACTURER of**

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by his competitors. But a manufacturer's word is not the **last**
word. Let the buyers have **their** say—then you get **facts.**

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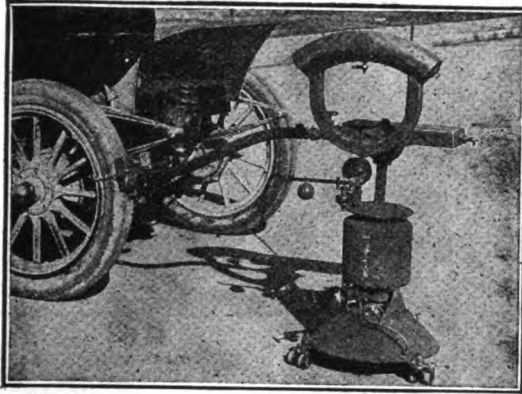
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A STEAM VULCANIZING PLANT

Complete for Casing and Tube Repairs yet so simple that it can be operated by your shop boy.

USED EVERYWHERE—ANY TIME



The M. A. C. VULCANIZER has an extension steam arm that permits you to take the heat to the tire while on the wheel. This is *but one feature*.

WRITE FOR OUR DESCRIPTIVE CATALOG.

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"Ideal Twin" Sleeve

To remedy a "blow-out," or if applied to a weak spot will keep an old shoe in service.

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4 " 1.50	4 1/2 " 1.75
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Designed to permanently as well as temporarily provide against "Blow-outs" or rim cuts. An inner sleeve and an outer jacket with wearing surface combined.

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For sale by principal dealers. If your dealer does not handle them, write direct to us.

Full Line Auto Tire Repairers' Stocks, Frictions, Tread Stock, Patching Gum, Cement Sheet, etc.

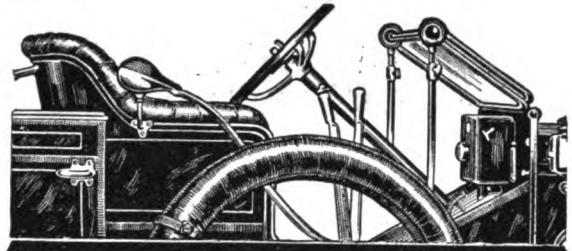
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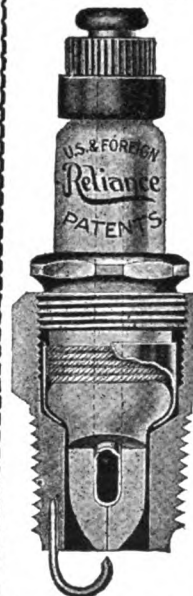
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Spark Plugs

are absolutely soot proof

—require no cleaning. Proof against any form of carbon—positively proof against any combination that you or anyone else can find in a gasoline engine cylinder. They work as long as there is any power in your batteries.

Equip your engine with Reliance Spark Plugs and you won't have spark plug troubles. You get an intense, concentrated spark from the Reliance every time—gives maximum power from each explosion—and, Reliance Plugs don't get dirty—never.

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We are the world's largest, exclusive manufacturers of spark plugs, and when you get genuine Reliance Plugs you get the best the market affords.

Write for free book—"Ignition and Spark Plug Talk"

The most complete and valuable pocket book on ignition ever published. Sent free on request.

Reliance Plugs are carried in stock by the best dealers and jobbers everywhere; mailed prepaid at prices quoted if your dealer can't supply you.

Standard Battery Type, all sizes
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Reliance Magneto Plugs,
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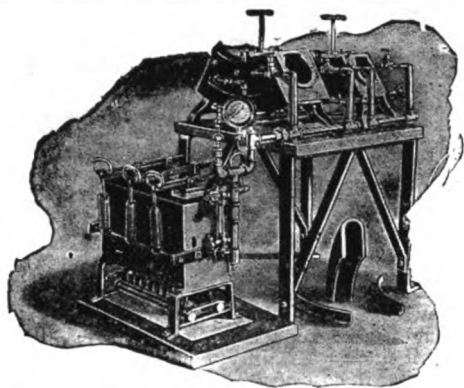
(Invaluable where an excess amount of oil is used.)

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MAKE MONEY REPAIRING TIRES



**COMPLETE OUTFIT. STEAM GENERATED
BY GAS, LINE OR GAS.
WE HAVE OTHER STYLES.**

either as part of a garage and general repair business or as a separate venture. Requires very little capital to equip a shop completely with the best tire repairing outfit in the world. The equipment can be paid for and a good profit made by the first season's work. Every motorist must have tires repaired—every motorist in your vicinity is a possible customer for tire repairing.

Get the right kind of equipment—one that produces work that you can guarantee—the Akron-Williams Tire Repair Equipment which was designed by practical tire factory repairman.

Localized heat is the secret of the Akron Williams. Three separate steam chambers in each of our sections, our exclusive patented feature, limit the curing process to the repaired part.

Proof that the Akron-Williams is the best is the fact that the big tire manufacturers use it—Firestone, Goodyear, Diamond, Republic, Pennsylvania, Revere, Hartford, Consolidated, Empire, Manhattan, Shawmut and many other tire manufacturers are among our customers. They know by experience what is most practical. We can equip a tire repairing plant of any desired capacity. Don't delay getting into this profitable business. Get into correspondence with us to-day.

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TO MOUNT ON THE BUFFING STAND.

Remove old tread and rough up carcass in a fraction of the time required by other methods.

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For making instantaneous and permanent repairs on bursted or torn Outer Casings and Inner Tubes.

Requires no heat, as Cement and Vulcanizing Solution unites patch and torn parts into one solid piece of rubber that cannot be separated without tearing.

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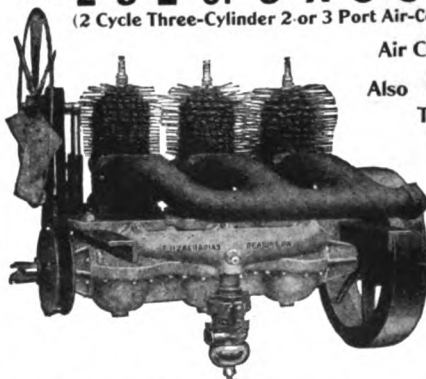
Air Cooled 20-22 H.P.

Also Made in One and Two Cylinders.

Construction is simple, durable, absolutely reliable, and smooth running.

All work thoroughly tested, and perfect satisfaction guaranteed.

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AUTOMOBILE

Bodies, Chassis, Wheels, Steering Devices, front and rear Axles, Steel Rims, etc.

GET OUR PRICES AT ONCE.

BORBEIN AUTO CO.



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CUT COST FOR GASOLENE

This little device saves 10 to 25 per cent of gasolene, increases power, delivers a perfect mixture to the engine.

\$3.00

GYREX
• THE MIXER •

\$3.00



Does what the best carburetor can't do—it thoroughly "mixes the mixture." Fits the intake pipe. Attached in five minutes. Is used on thousands of cars. We have hundreds of unsolicited testimonials regarding its efficiency.

The GYREX is a little nickel steel turbine mounted on ball-bearings. Very simple in construction—nothing complicated. As the mixture of gasolene vapor passes through, the GYREX spins around, mixes the mixture, and the cylinders receive an even, smooth mixture of the proper consistency.

The GYREX prevents streakiness, eliminates vibration over-heating and makes the motor run quietly and smoothly.

WE SEND IT TO YOU ON TRIAL.

We are so sure that you will be delighted with the GYREX, that we send it to you on trial. Send us \$3 00 and we will mail a GYREX to you. If it does not prove its worth within 10 days, return to us and your money will be cheerfully refunded.

Send for one to-day. Your car will be much more efficient—you can't lose but you can win a great deal of satisfaction and cut your gasolene bills 25 per cent.

ROYAL EQUIPMENT COMPANY,
450 Housatonic Avenue, Bridgeport Conn.

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THE STRYKER MUFFLER CUTOUT

Last year he used a "Stryker" on his old car, and learned what a muffler cutout should do.

This year his new car was equipped with a muffler cutout—but he could see no difference when he used it—so he put on a "Stryker."

The "Stryker" materially increased his power, and reduced his gasoline consumption one-third.

Send for Booklet on Cutouts.

C. W. STRYKER, Syracuse, N. Y.

Try Dixon's Motor Graphite

Just try it once and see how much easier, smoother and more quietly your car will run. Dixon's Graphite saves time and trouble. Write for free sample, G-184.

Joseph Dixon Crucible Company,
JERSEY CITY, N. J.

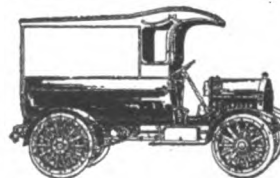


Made in all sizes and weights for Automobile purposes. Can be used thinner than any other lock washer—effective, no matter how thin. One lock under the nut and head can be used if so desired. Exhaustive tests, covering a period of nearly 18 years on railroad track, drop presses, Automobiles and machinery subject to vibration, have proven its superiority over every nut lock manufactured. Write for samples and price. Made exclusively by the

POSITIVE LOCK WASHER CO., Newark, N. J.
All others are imitations.



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describing Victor Trucks, 1 1-2, 2 1-2, 3 1-2 and 5 tons capacity, 1500 pound Delivery Wagons, Ambulances, Police Patrols, Fire Trucks and Sight Seeing Cars.

VICTOR MOTOR TRUCK COMPANY

1500 Pound Delivery Wagon 1450 Niagara St., Buffalo, N. Y.

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Yes!—I mean every word I say, when I guarantee you 10,000 miles service on every 1911 "BRICTSON" Heavy Car Type Tread, and I will positively make good my guarantee. I have been studying this tread proposition for the last six years and have devoted the best of my life in perfecting this wonderful tread. Yes! Wonderful, that is just what I mean and I am not afraid to look you square in the face when I say it.

Mr. Motorist, you cannot afford as a matter of economy to run your car without using the 1911 "BRICTSON" Detachable Heavy Car Type Tread, when I am offering you a guarantee of

10,000 MILES

WRITE FOR A COPY OF MY GUARANTEE

Let me prove it to you by the hundreds of letters in our files from satisfied customers that are just as enthusiastic over BRICTSON DETACHABLE TREADS as I am. While dictating this advertisement to my Edison Business Phonograph, a letter from one of our customers was laid on my desk, which letter all must be compelled to believe, for it was absolutely unsolicited and from a man with a high moral standing, as his calling will indicate. The letter reads as follows:—

METHODIST EPISCOPAL CHURCH,
Rev. L. S. McKown, Minister.

O. A. Brictson, Pres.,
Brictson Mfg. Co., Brookings, S. D.

Vienna, Ill., March 15, 1911.

Dear Sirs:—I have been using the Brictson Tread on a Buick car for over two years, and I find that they give entire satisfaction. Since coming to this city I find every other Tread except the Brictson, and I am desirous that my friends get the best, hence I write for the agency, and your best net prices. And in order that I may be the first in the field here, please ship me by return Express, one set (4 Treads) of Brictson Detachable Tire Treads for tires 32x3 1/2. Ship C. O. D.

Yours Very Truly, (Signed) L. S. McKOWN.

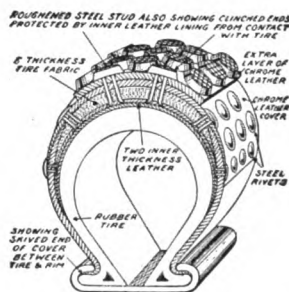
Right here I want to say that the treads referred to in the above letter were made two years ago, when we were in the experimental stage, and which goes to prove even though our treads were not perfected at the time, the principle was absolutely right. Think of a man running a car equipped with the same tires for two long years, all the while under "BRICTSON" DETACHABLE TREADS, and then ask yourself, "Do they rot the rubber tires?" I want to tell you, gentlemen, that this rotting, heating, burning, creeping, stretching, and injuring the rubber casing that you have heard so much talk about is all "bosh" with the Brictson, and I can prove it, not only by the above unsolicited letter, but by hundreds of others, copies of which will be gladly forwarded upon request.

Brictson Detachable Tire Treads

"The Enemy of Tire Expense"

The cross section illustration on this page represents the construction of the BRICTSON Heavy Car Type Tread. First there is a layer of specially tanned, extra pliable chrome leather. On the tread part outside of this leather is another strip of chrome leather, which entirely covers the tread surface that is exposed to the road. Next to these two thicknesses of leather are five layers,—did you get that?—five layers of the very best quality tire fabric. It would be an easy matter for us to use one, two, three, or even four layers of tire fabric in order to save money, but we have found from years of experience that it is absolutely necessary to use not less than five layers of the tire fabric to obtain perfect strength and to prevent the tread from stretching, that is why we use five layers of tire fabric. A tread made without sufficient fabric would be worthless on account of stretching, causing it to sag and become loose on the rubber casing. That is why all rubber casings are rivets are clinched into another layer of leather which immediately follows next to the tire fabric, and then there is yet another layer of chrome leather, which covers the clinched ends of the studs and prevents them from coming in contact with the rubber tire.

Is there any wonder then that users of "BRICTSON" DETACHABLE TREADS say they are the best tire protectors in the world? And you must certainly admit it after you have read and studied the foregoing construction and illustrations.



We are going to establish **TO DEALERS** every city and town and have a very interesting proposition to offer. Fill out and mail coupon to the left and immediately upon receipt of same I will mail you my new 1911 catalogue together with my exclusive agency proposition and contracts for your approval. Don't delay! Write today, for we give only one exclusive agency in each place.

O. A. Brictson,
President,
The Brictson Mfg. Co.,
161 Brictson Bldg.,
Brookings, So. Dak.
Without obligation on my part,
send me your exclusive Agency Propo-
sition, 1911 Catalogue and Dealer's Folder.

O. A. BRICTSON, PRESIDENT
The Brictson Mfg. Co.
161 BRICTSON BUILDING
Brookings, South Dakota

MOTORIST'S COUPON.
I am interested and would like to know more about "Brictson" Detachable Treads. Send me your booklet, "The Enemy of Tire Expense," Proofs from Automobile Owners, Prices, etc.

O. A. Brictson,
President,
The Brictson Mfg. Co.,
161 Brictson Bldg.,
Brookings, So. Dak.

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CONCERNING

K & W PATENT RELINERS

To Consumers, Dealers, Jobbers and Tire Repair People.



Reg. Applied For.

Above shows K & W Reliners strengthen tires so much that they may be worn entirely through without having blow-outs.

The K & W Patent Reliner

was "the first successful reliner" ever manufactured, and is, and always has been, made of a better quality of material than any imitation or infringement.

Remember, The K & W Patent Reliner is Fully Guaranteed.

TIRE REPAIR PEOPLE everywhere are using K & W Patent Reliners in their repair work, which proves they are a good thing to strengthen weak tires.

We guarantee K & W Patent Reliners to eliminate your tire trouble and tire expense and agree to refund money if reliners are not satisfactory in every way.

You might be surprised to know that there are nearly 25,000 K & W Patent Reliners in successful use at the present time.

EXHIBITED

At the New York and Chicago Shows, also at Boston, Minneapolis, Washington and Kansas City.

**Be sure you get a K & W
IT'S BEST.**

For sale by nearly all dealers, jobbers and tire repair companies. If your dealer does not have them, write us **AT ONCE** for our Proposition on a Trial Order.

K & W MFG. CO., 3rd St., Ashland, Ohio.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

As manufacturers of K & W Patent Reliners, which are sometimes called Inner-Shoes, Inside Tire Protectors, Inner-Tires or Tire Reinforcements, we are pleased to advise you that we own, **EXCLUSIVELY**, patents which are basic and which cover the reliner thoroughly. What the **SELDEN PATENT** is to the gasoline automobile—our patents are to the successful inside tire protectors.

No doubt you are aware that there are several imitations and infringements on the market, the manufacturers of which claim to have "something just as good." Our reliners are semi-cured; a feature which is covered by patents. Under-cured reliners tend to become cured by the heat generated by the friction of the tire on the road, while full cured reliners would become over-cured and deteriorate rapidly. This is why **semi-cured** reliners remain soft and pliable and are of long life.

The K & W Patent Reliner is coated with a vulcanizing compound which causes it to adhere firmly to inner walls of tire. Thus, it will not creep or generate heat by its use. This feature is also patented. Patents "also" cover coating inside of tire with a vulcanizing compound before applying Reliner.

Therefore, when anyone offers you a semi-cured or cement coated reliner by whatever name called, they are imitators or infringers unless the following dates of patents are stamped on inside of reliner:—"Dec. 28th, 1909, and Jan. 4th, 1910." Evidence is being secured against infringers and prosecutions will follow.

Why should you purchase these imitations and infringements when you can purchase the original "patented" reliner at no greater cost?



The above picture is no exaggeration. Note the following: Your "picture frame" or "collar" tire with man's head through it is no worse than the one that I had on my car, and it never blew out after the Reliner was put in.

Yours truly,
F. LEE ROGERS, Auburn, N. Y.

Jul 21 1911

Automobile Dealer and Repairer



A JOURNAL OF PRACTICAL MOTERING

REGISTERED IN U. S. PATENT OFFICE

THE MOTOR VEHICLE PUBLISHING CO., 24 Murray Street, New York.

Vol. 11, No. 5.

NEW YORK, JULY, 1911.

Monthly, \$1.00 per year.
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Polarine



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Red Head

ON another auspicious occasion—March 4th, 1909—the RED HEAD Spark Plug was inaugurated. On that day we predicted that RED HEADS would become the most popular spark plugs on the market.

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The new RED HEAD was born in the laboratory of theory and grew up in the shop of experience. It has only a family resemblance to the first RED HEAD.

On the 1912 plug the metal discs and packing that take care of expansion and contraction of the center electrode are sealed within a brass cap crimped under the shoulder of the porcelain—that eliminates loss of compression and blow-outs. A longer porcelain has been provided—that prevents short-circuits. Also a two-piece bushing, part of which is a flexible cone seat: the more the bushing is turned down, the tighter the joint. The 1912 plug has a blue oil-finish body, heat treated—that harmonizes with the finish of the motor and does not rust or "freeze."

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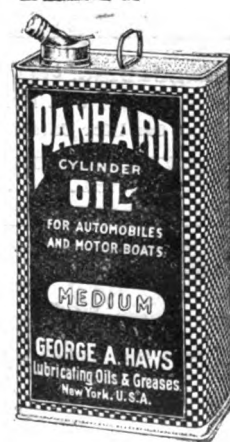
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Will not injure the
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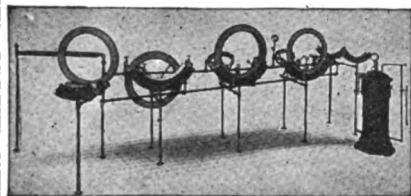
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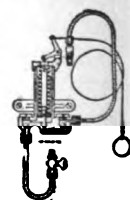
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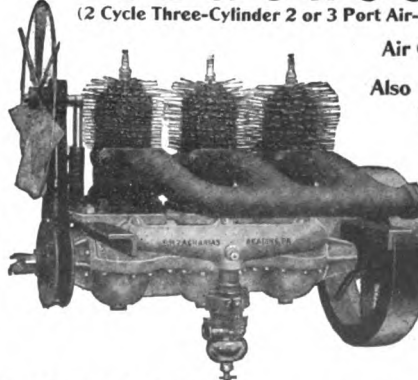
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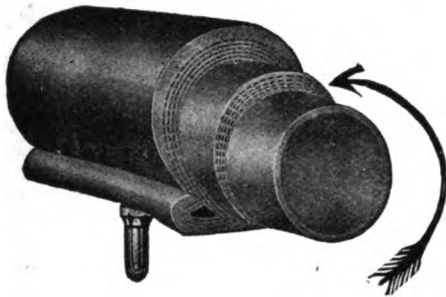
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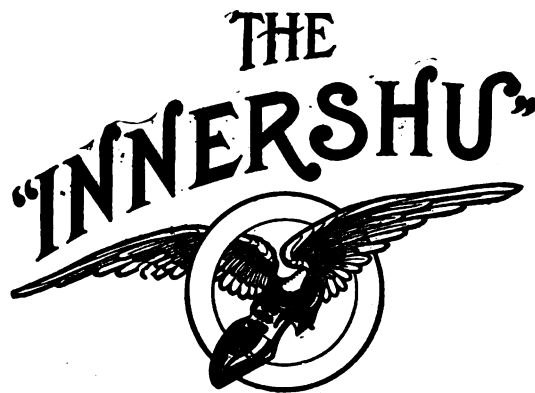


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GIVES An Absolute **GUARANTEE**

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Would not be of such vital importance to you if it were not for the delays and inconvenience caused by punctures.

At least 95% of your punctures can be prevented and the life of your tires more than doubled by having them treated by our

TRIPLE TREAD PROCESS

We cover your casing with three plies of best grade waterproof French Chrome leather, running one ply of this leather over the bead of the casing to prevent rim cutting. The outer ply of leather also comes down the sides of the case to give added protection against rut wear. The tread of the casing is also protected by from three to six rows of hardened steel studs (depending on size), and the sides of the casing are protected by flat headed rivets.

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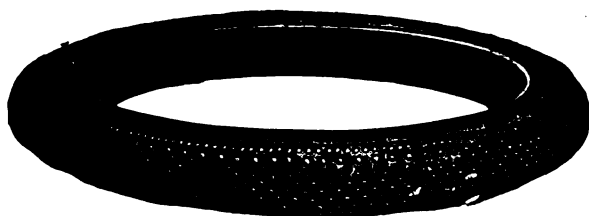
The Triple Tread is not an experiment, it having been on the market and giving successful service for the past three years. When the Triple Tread is applied on your casings it will add a new pleasure to motoring by making your tires

PUNCTURE PROOF AND NON-SKID

Call on or write to our nearest factory for full particulars and prices.

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The successful imitator of Prest-O-Lite will have to do two things:

1st: Furnish more gas and better gas, at a better price. Every imitator has claimed to do this, but not one ever made good the claim.

2nd: Furnish a widespread, dependable exchange service. Every imitator has claimed that he had this, or would have it in a year. Not one ever made good the claim. Most dealers knew better than to bite at the imitator's bait after one bitter experience. And they are not biting now.

Every imitator in the past has failed to make good his glowing promises, and has quit the business, leaving dealers and their customers "holding the sack" with empty tanks that could neither be sold nor refilled.

Remember, too, that imitators have yet to prove that they have the legal right to even be in the gas tank business.

The lesson of the past is eloquent. Don't gamble on what any imitator promises, claims or hopes to do. Let the imitator experiment with his own money, not with **yours**.

Of course, there will be a few dealers who will "take a chance."

But You Take No Chance On

PREST-O-LITE

It's the tank your customer wants.

It's the tank that, when empty, can be promptly exchanged, **anywhere and always**.

It's the tank that **always** gives full measure of gas of the highest quality.

Prest-O-Lite has always been a big **money-maker** for dealers, and has given SERVICE and SATISFACTION to their customers.

Imitations have always been **money-losers** for dealers, and have always deluded and disappointed their customers.

The experienced dealer does not need to be reminded of all this. But the new dealer, or the one who has never fooled with the imitator's buzz-saw, may profit by this information.

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Indianapolis, Ind.

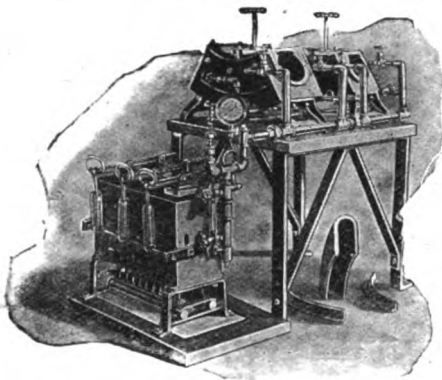
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MAKE MONEY REPAIRING TIRES



**COMPLETE OUTFIT. STEAM GENERATED
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WE HAVE OTHER STYLES.**

either as part of a garage and general repair business or as a separate venture. Requires very little capital to equip a shop completely with the best tire repairing outfit in the world. The equipment can be paid for and a good profit made by the first season's work. Every motorist must have tires repaired—every motorist in your vicinity is a possible customer for tire repairing.

Get the right kind of equipment—one that produces work that you can guarantee—the Akron-Williams Tire Repair Equipment which was designed by practical tire factory repairman.

Localized heat is the secret of the Akron Williams. Three separate steam chambers in each of our sections, our exclusive patented feature, limit the curing process to the repaired part.

Proof that the Akron-Williams is the best is the fact that the big tire manufacturers use it—Firestone, Goodyear, Diamond, Republic, Pennsylvania, Revere, Hartford, Consolidated, Empire, Manhattan, Shawmut and many other tire manufacturers are among our customers. They know by experience what is most practical. We can equip a tire repairing plant of any desired capacity. Don't delay getting into this profitable business. Get into correspondence with us to-day.

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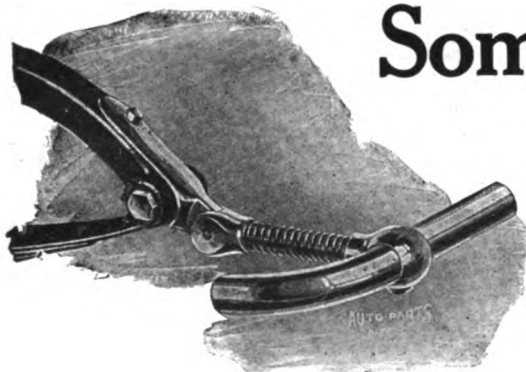
Remove old tread and rough up carcass in a fraction of the time required by other methods.

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Some of Our Specialties



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The reason there are not more Bumpers used is that owners object to the changing of the spring hanger bolt and drilling numerous holes in the frame. To attach our Bumper, drill one 5/16 in. hole in the end of side bar and fasten as shown in cut, which can be done in ten minutes, and will fit any car.

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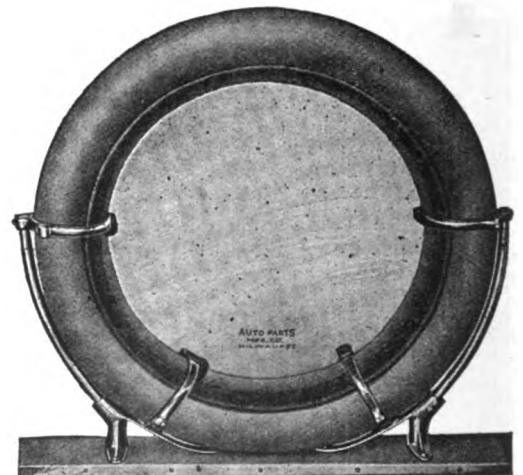
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BADGER TIRE HOLDER

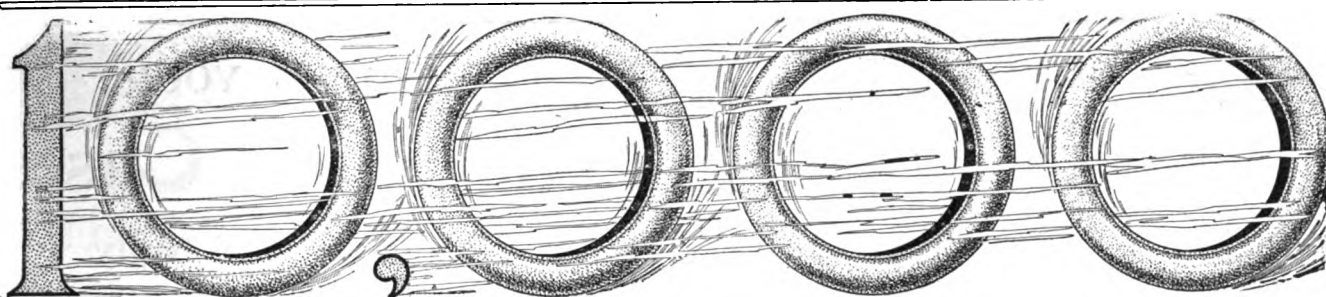
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They will hold one or two, three and one-half to five inch tires, and can be equipped with chain and padlock instead of straps if desired.

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That test, to be successful, demanded perfect lubrication. He could not afford to take any chances—this was not a time to experiment with untried, unproved oils and greases.

Guess what lubricant that big automobile builder chose?



Yes, he chose Keystone Grease and Keystone Motor Oil—and his motor completed the 10,000 miles in good shape—without a single stop.

He chose Keystone Grease, because it had **proved** to have a lower friction test than any other lubricant on the market.

Keystone Grease always lubricates perfectly—never becomes gummy—and keeps its original consistency under all speeds, pressures and temperatures.

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Keystone Motor Oil is a cylinder oil of the same high standard as Keystone Grease. It is the only lubricant that

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Our Guarantee

One pound of Keystone Grease is equal to three or four pounds of any other grease or lubricating compound—or four to six gallons of any bearing oil.

Keystone Grease and Keystone Motor Oil can be bought from all dealers and garages—or direct from any of our branch offices.

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WE WELD ALL KINDS OF BROKEN MACHINERY

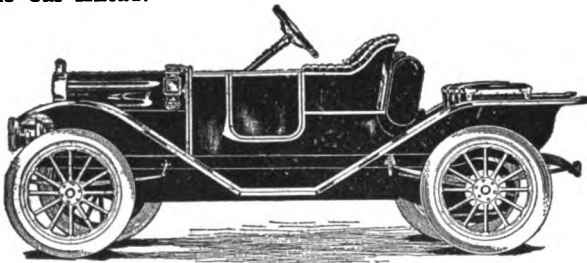
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This newest Model H Roadster possesses all of the distinctive Cartercar features such as Friction Transmission and Chain-in-Oil Drive which have made their cars favorites for several years. It also comes as a touring car at \$1,150.

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Model M, 40 H. P. fore-door touring car with 120-inch wheel base, 4x36 inch tires, with finest mohair top, envelope, storm curtains, wind shield, speedometer, gas tank, gas lamps, oil lamps, tools, etc., at \$1,875.

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"The Car Ahead."

PONTIAC, MICHIGAN

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Is very clearly and fully explained in our little booklet

**"THE CARE AND
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If you own an automobile, you cannot afford to be without it, as it will help you to

**REDUCE TIRE EXPENSE
50% to 75%.**

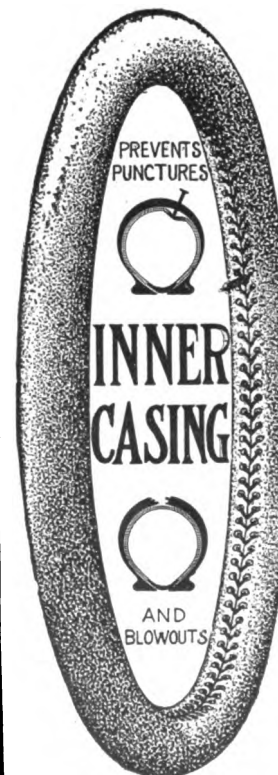
It tells you how to make new tires last 10,000 miles and over. It explains how to wear out your tires without the great annoyance of blowouts, and how to keep your tires in proper repair.

We will send a limited number of these valuable little booklets FREE, postage paid, on request.

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Study The Table

TIRES

Here is the One Disinterested Answer

Motorists Who Used Them Got An Average of 2,213 Miles Greater Tire Service For Each And Every Car They Ran, That As Against The General Tire Field, Was Purely "Velvet."

Mileage Results Obtained by Users of All Principal Makes of Tires

Diamond Tires—Greatest Mileage—Best!

Make of Tire	A	B	C	D	E	F	G	H	I	J
	Diamond	MAKE	MAKE	MAKE	MAKE	MAKE	MAKE	MAKE	MAKE	MAKE
Sets Reported	41½	43	13	1¼	8	7	6	7	4	3
Grand Total Mileage	256,639	239,975	70,300	65,798	34,100	21,594	20,236	20,200	14,000	8,450
Grand Total Time in Use	339½ mo.	404½ mo	122½ mo	82 mo	93½ mo	61½ mo	37 mo	46½ mo	26 mo	12½ mo
Grand Average Mileage	6221	5580	5361	5371	4363	3084	3372	2825	3500	2816
Grand Total All Punctures	101	151	84	49	77	20	24	16	19	6
Grand Total Extra Casings used in time and mileage stated	23	34	6	6	9	6	9	3	5	1
Grand Total Extra Tubes used in time and mileage stated	54	73	24	10	9	17	7	9	5	4
Average Period of Use	8½ mo.	9 ² / ₁₀ mo	9 ² / ₈ mo	6 ⁷ / ₁₀ mo	11 ⁷ / ₁₀ mo	8 ² / ₈ mo	6 ² / ₈ mo	6 ² / ₈ mo	6 ² / ₈ mo	4 ¹ / ₈ mo
Average Monthly Mileage	775 ² / ₁₀	593½	573½	802½	364 ⁷ / ₁₀	351 ¹ / ₁₀	546 ² / ₁₀	436½	538½	676

NOTE THAT Within a shorter total time—indicating their use on largest and fastest cars—Diamond tires gave more mileage than any other tire, by from 11½ per cent. up to 120 per cent. above competing makes.

Observe, also, that users of Diamond tires bought fewer new tubes than users of other tires. This saving was in addition to the greater mileage they obtained.

We are able further to state that the total number of reports received by Mr. Weygandt, including those not tabulated for want of specific data, showed more Diamond Tires than any other in use.

Diamond Tires are just as good on the lighter, lower priced cars as on the heavier machines and give even greater mileage.

Don't think you can't use Diamond tires on your car because your original tires were something else. No matter what tires you have been using you can get Diamond tires to replace them, and this whatever style of wheel rim you have. You must be careful to specify the size and style. If you do not know the name of your style we can tell you.

Write for Booklet Containing the Complete Story of Mr. Weygandt's Inquiry and our book of Tire Instructions. Both are free.

THE DIAMOND RUBBER CO., AKRON, OHIO

Distributing Points and Service Stations in 54 Cities, Covering Every Section.

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Prest-O-Tire Tube

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Don't spoil an entire day's enjoyment by pumping up a tire.

That's the Prest-O-Tire Tube's business.

For 20c. this little tube—a foot long, an inch in diameter—pumps a flat 36x5 tire in an instant.

Just attach the valve—turn the thumbscrew—and smile That's all.

The initial cost—Tubes for tires up to 4 inch diameter \$1 each; larger size, \$1.25; Valve and connections for any number of tubes, \$2; Recharging, 20c. each.

PROVE IT Ask your dealer for the outfit—try it thirty days—your money back if you are not satisfied.

Each tube comes to you hermetically sealed—no chance for leakage. Your dealer has it. If he hasn't, ask him to order it for you, or write us.

THE PREST-O-LITE CO.

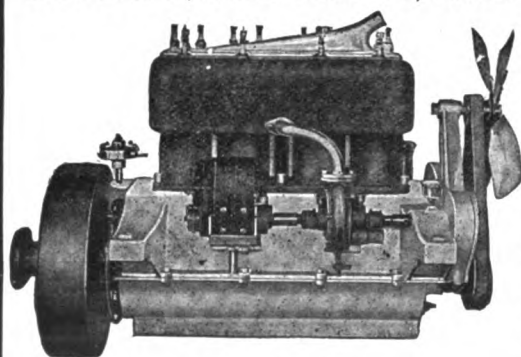
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LONG STROKE, LARGE BEARINGS, LARGE VALVES



New Design of Block Motor

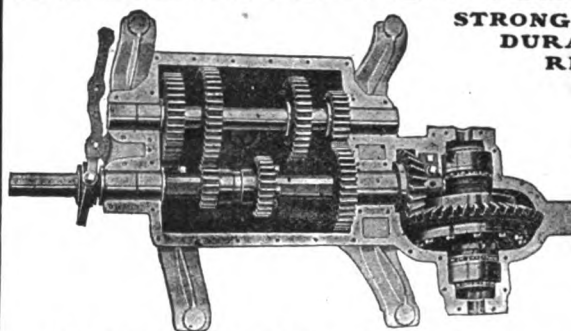
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Crank Shaft
Strong
Substantial
Reliable
and Smooth
Running

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STRONG
DURABLE
RELIABLE



No. 5 Gears,
1 1/2 in. face,
5 pitch.

No. 4 Gears,
1 1/2 in. face,
6 pitch.

Fitted with
Equalizing
Gear for
double chain
drive.

Intended for the heaviest types of pleasure and commercial cars.
Also Planetary and Selective type transmissions.

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(A THICK OIL CREAM METAL POLISH—leaves no powder or sediment—best for quick action, brilliancy and lasting lustre.

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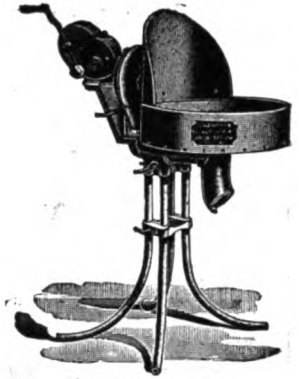
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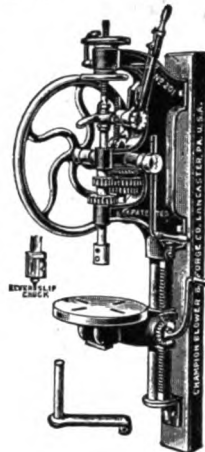
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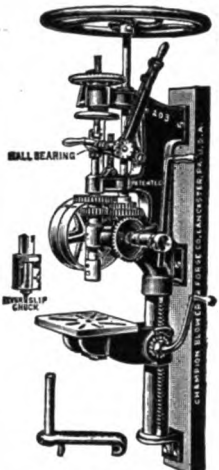
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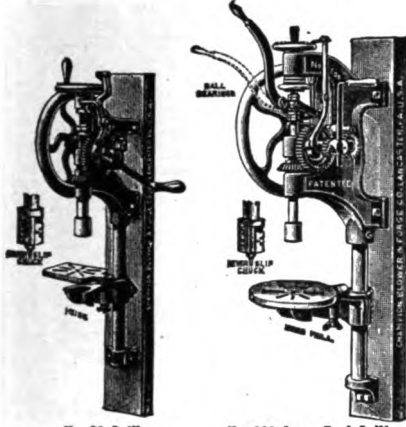
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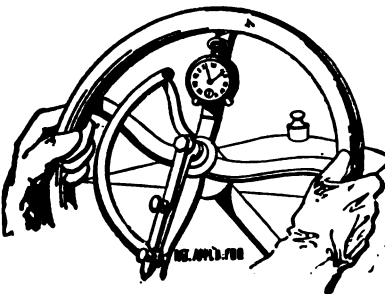
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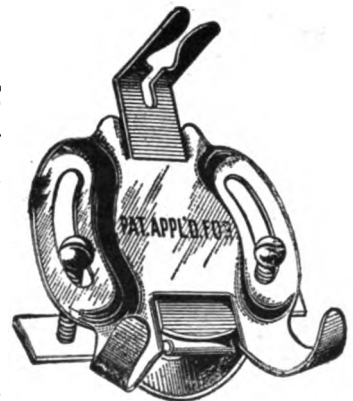


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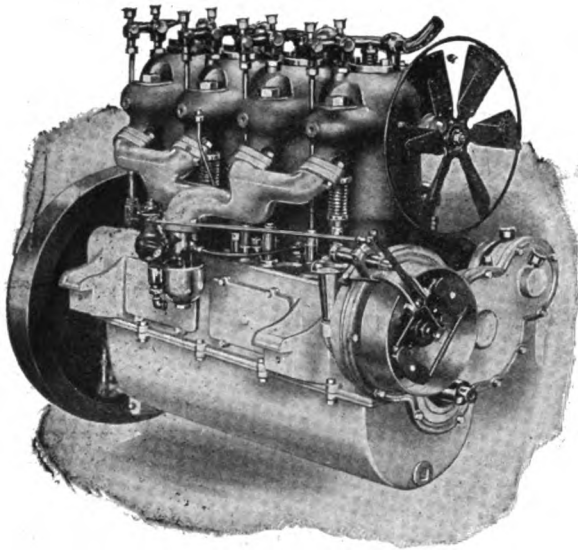
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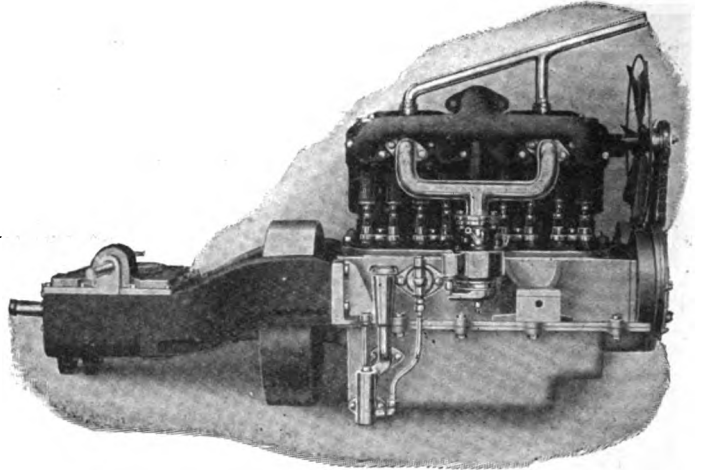
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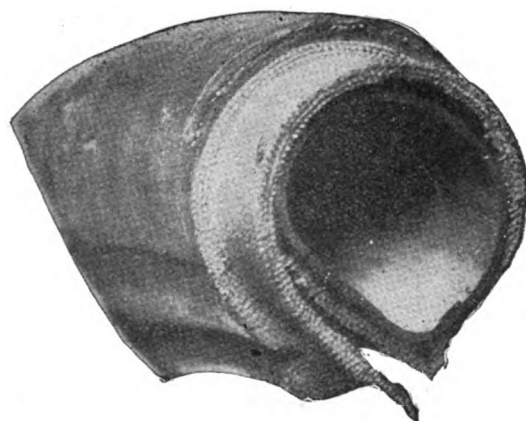
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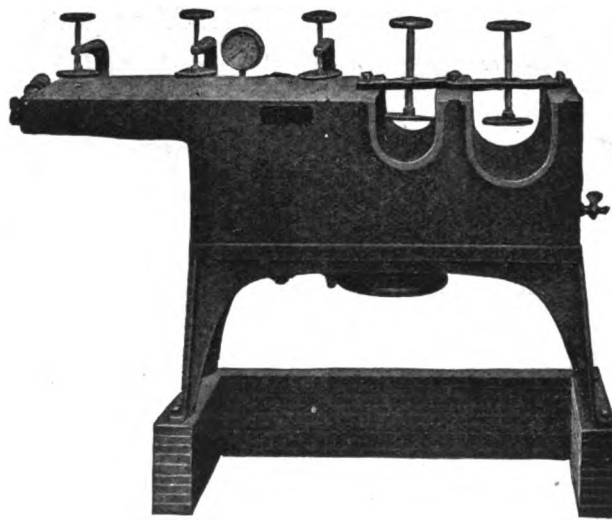
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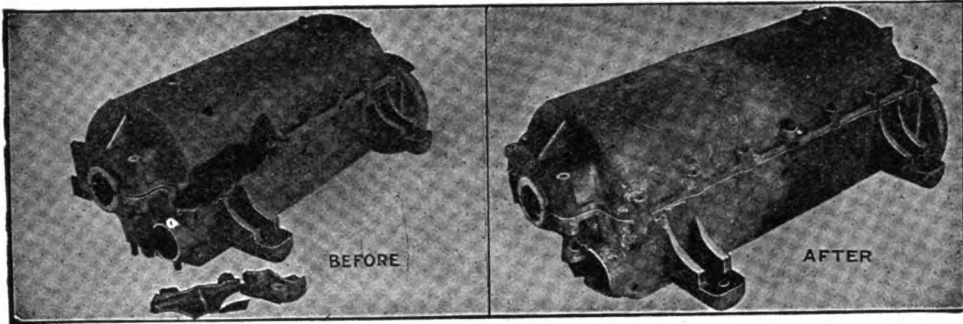
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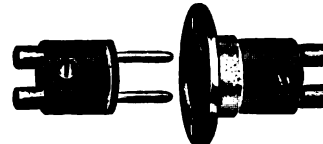
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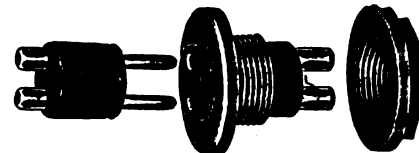
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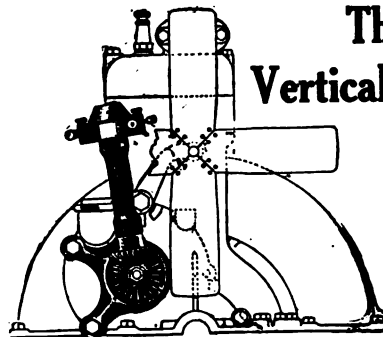
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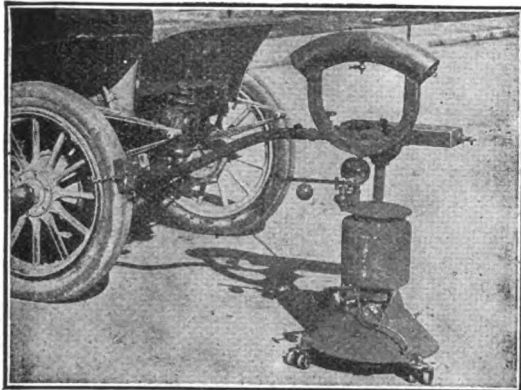
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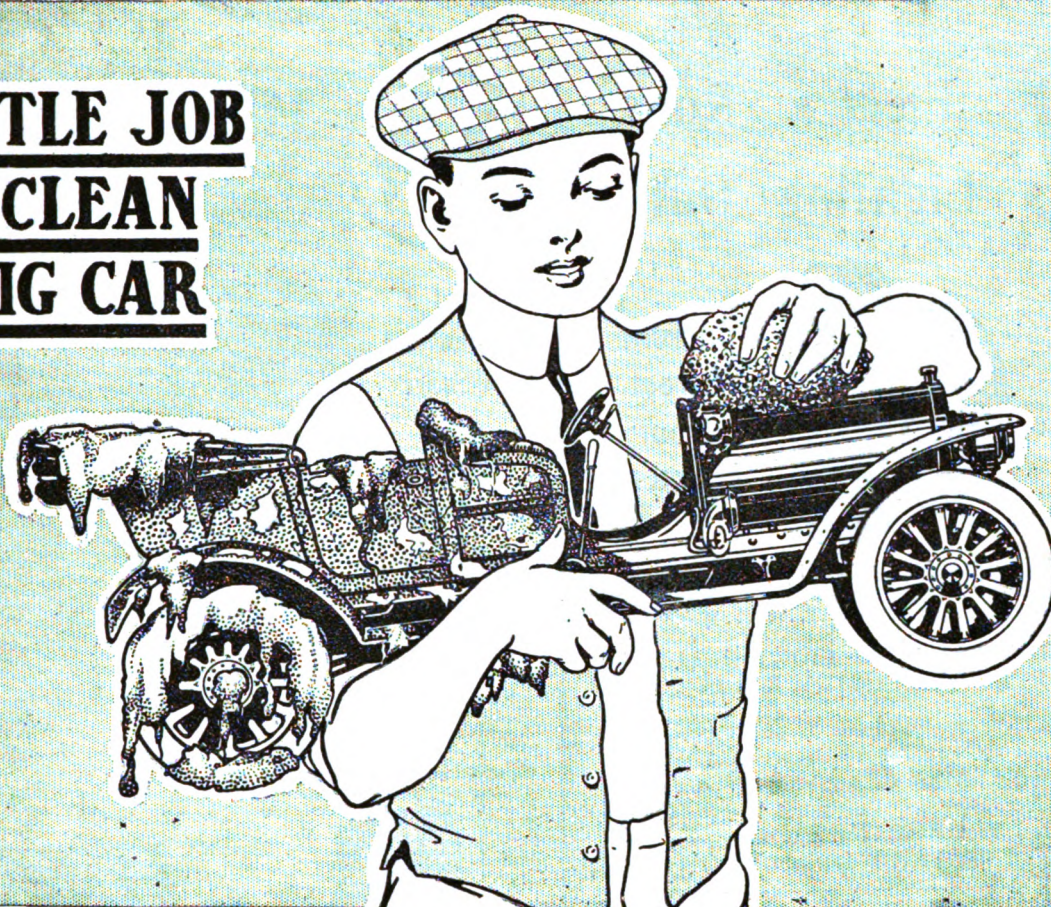
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Send me free sample of “Buckeye Cleanser” and booklet.

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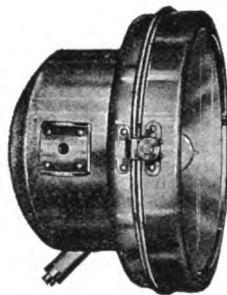
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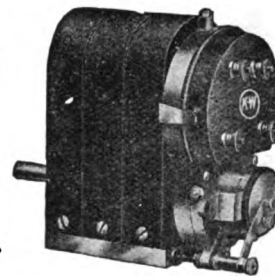


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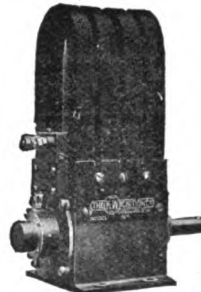
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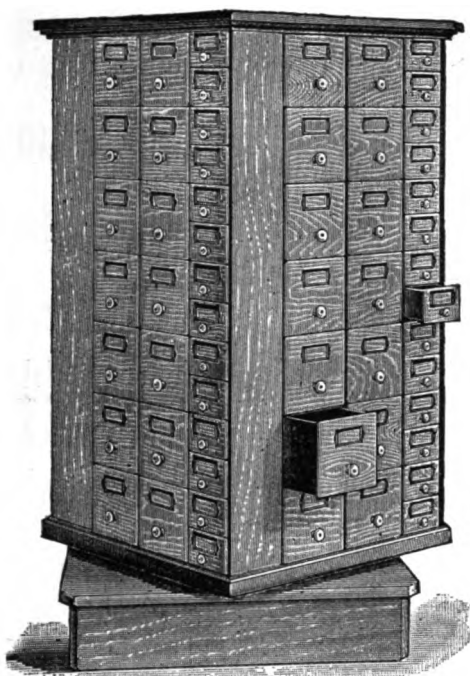
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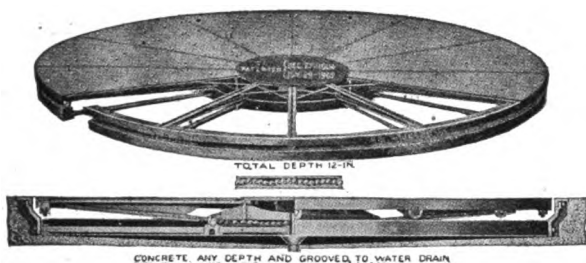
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BRANCHES: — New York, Philadelphia, Boston, Chicago, Pittsburg, Cincinnati, Indianapolis, Terre Haute, Savannah, Charlotte, Knoxville.

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Time Tried and Tested



Concrete any depth and grooved to water drain.

Furnished complete and made in following sizes :

Wheelbase, 108, 132, 144, 156 inches.

Table diameters, 12, 14, 15, 16 feet.

Supporting capacity, 8,000 pounds.

Ball bearing — friction minimized — easily turned — never gets out of order.

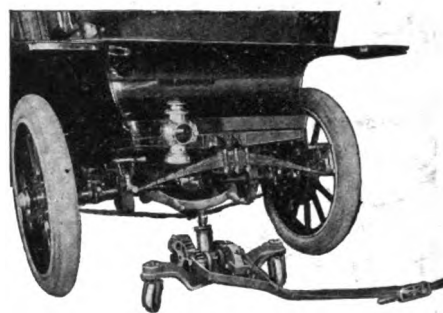
A turntable in your garage prevents accidents, lessens your repair bills, saves its original cost in a short time.

BUY THE BEST

Write for catalog and booklet of testimonials. Blue prints and erection directions furnished with table.

The Canton Foundry & Machine Co.
Dept. "G." Canton, Ohio.

THE "AUTO" JACK



The utility of this Jack is apparent at first sight. Built to lift both wheels at same time, fitted with castor wheels, ball and roller bearing. Auto can be moved to any part of garage when elevated on Jack.

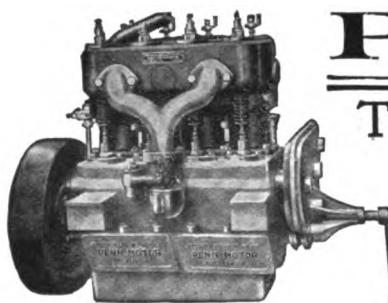
This Jack designed to handle heavy weights, is neat, durable and will endure long service.

Tongue is used as lifting bar to elevate Jack, or pulling the Jack with its load to any location.

Made with three or four wheels, by

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Agents Wanted. Write for Prices



PENN MOTORS

THIS construction enables us to build the lightest, most compact and durable motor on the market.

Large Valve Areas and short lifts add to the power as well as the quiet running.

Crank-shafts of the suspended type.

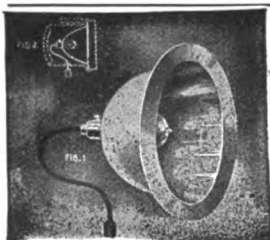
Motors are equipped with a self-contained oiling system, and all parts are interchangeable and accessible.

Large Water Jackets, circulation being complete around cylinders, and valve chambers of sufficient area to make possible to run either by forced circulation or Thermo Syphon.

TWO TYPES { 20-24 H. P., 4-cyl., 3½-in. bore, 4½-in. stroke.
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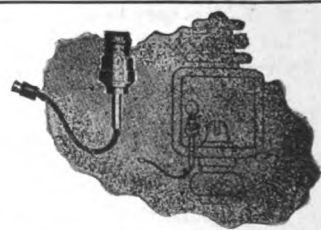
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Ask for Booklet No. 3—it tells you all about it.

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Escape by using **YANKEE TIRES AND TUBES**

The quality will satisfy you. Prices will surprise you.

No better tires or inner tubes at any price.

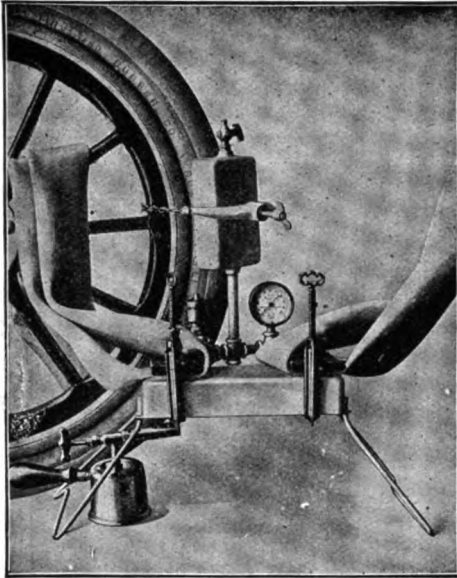
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**Pittsburg
Portable
Steam
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For the Owner or the Garage

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Sold with a Money-back Guarantee

By means of our Inside Tire Vulcanizer, a blowout or section ten inches long can be repaired with one-half the material used by the average repairman, and the repaired part will be stronger than any other part of the tire.

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For One Year*

Spark Troubles Ended

You can have Spark Plugs that do business every minute—that you can put in your motor and forget—that never short—never soot over—never break porcelains—or cause trouble of any sort—by insisting on

**Never-Miss
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Any Size or Type \$1.00

—the latest and best in Spark Plug construction. You'll get lots more satisfaction from your motor when you use them—over a million and a quarter thoroughly satisfied Never-Miss users. Magneto, Regular, Extension Types—open end, Mica, Porcelain, Lava.

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They describe several systems of finishing, including

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Ocean to Ocean on Nobby Treads

On Monday morning, June 26th, fourteen Premier cars, all equipped with United States Tires (Nobby Treads rear, Plain Treads front), started from Atlantic City, on a six weeks tour across the Continent. The start was made with the Nobby Tread shod rear wheels backed into the Atlantic. They will finish with the front wheels immersed in the Pacific.

That Nobby Treads should have been chosen for the strenuous rear wheel service they are certain to encounter on this trip, is convincing proof of their reputation for all-around serviceability.

Of even greater importance, however, is the opportunity it will give the motorists and dealers of this country to witness the most severe and searching test of a non-skid tire that has ever been made.

Five thousand miles will be covered—a dozen states and two mountain ranges will be crossed. The "Nobbies" will be called upon to endure every kind of service it is possible to put a tire through.

Watch the result! It will be a big help to tourists, and others who require unusually strong tires, in deciding on their tire equipment.

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Make Good Because
They Are Good***

United States Tire Company
Broadway at 58th Street
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Edelmann Tire Gauge

WELL, THEY ARE STILL GOING AS FAST AS EVER—AND THEN SOME!

If you haven't already bought an Edelmann Tire Gauge, you are still guessing at your tire pressure! With this gauge you get the **Correct Pressure** and you can read the gauge after it is removed from the tire.

Guaranteed correct within 2%.

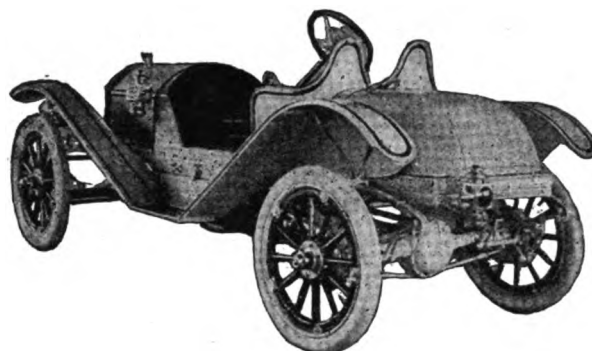


Send us \$1.50 to-day and we will send you one of these gauges packed in a leather case.

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G. J. G. "Junior"



The G. J. G. "JUNIOR" is a racy-looking runabout that is **GUARANTEED FOR ONE YEAR**

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Its equipment includes a Bosch high tension magneto and Dorian quick-detachable re-mountable rims, with an extra rim for 32x3 1/2 inch tires, gas head lights and generator, oil side and tail lights, and many other excellent features.

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"BEST" The Hotter the Weather
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RUBBER CEMENT

For repairing Automobile and Bicycle tubes and tires.

This cement will do anything in the way of cementing. It will cement rubber to leather.

Best there is for plugging purposes.

If your dealer does not handle our cement, send us 40 cents in stamps and we will mail you a 4 oz. tube; or 90 cents for 1 dozen No. 1 tubes. Jobbers and Dealers write for our prices and discounts of Quality Cement.

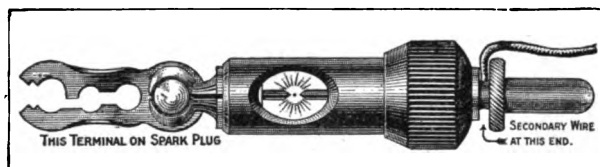
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FERNWOOD, DEL. CO., PA.

HENRY E. EBY, Gen. Mgr.

PUT THIS ON YOUR ENGINE



It will locate ignition troubles at once and increase your engine **EFFICIENCY**. A **PHELPS TROUBLE FINDER** doubles the joy of motoring by halving motor troubles. It frequently quadruples the life of the spark plug and increases the intensity of the spark.

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The spark in the **PHELPS TROUBLE FINDER** is always visible yet perfectly protected from the atmosphere and gasoline fumes, thus preventing danger of fire or invalidating insurance.

Thousands of users now endorse the **PHELPS TROUBLE FINDER**. Attach a set to your spark plugs and leave them there. They outlast the motor, are always on the job and save you many times their cost in real money.

You need one for each spark plug on your car. Fill in this order and mail **TO-DAY**.

NEW ENGLAND EQUIPMENT CO.,

Warren Chambers, Boston, Mass.

Gentlemen:—Please send me, postage paid,.....Phelps Trouble Finders at \$1.00 each. Enclosed is \$.....to pay for them. It is understood that you are to refund this money, upon return of goods uninjured, if they fail to do what you claim for them.

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JUST AS EASILY BUILT RIGHT AS WRONG
AND A GREAT DEAL CHEAPER TOO IF YOU GET OUR
FREE WORKING PLANS



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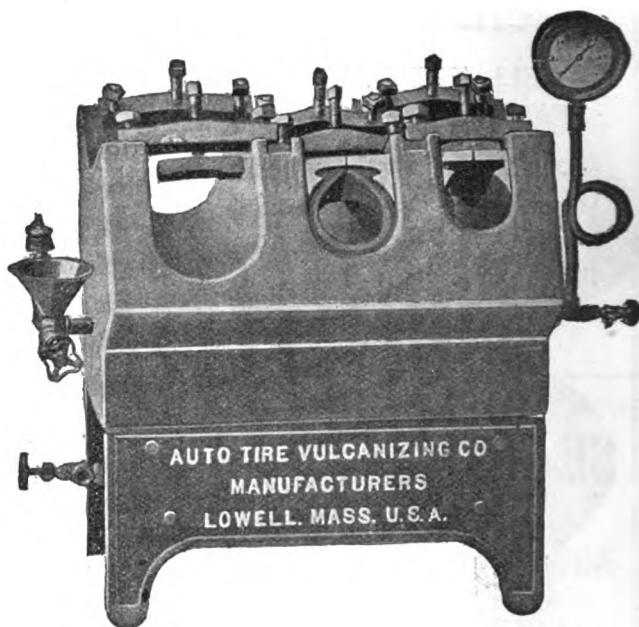
Pitless Auto Turntable Co.

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References As to our reliability and standing ask any Bank or Commercial Agency in Kansas City



Our New No. 8 Adjustable Sectional Vulcanizer With Three Cavities



As a Progressive Business Man you should by all means use, handle or recommend our

New Improved Auto-Tire VULCANIZING MACHINE

simply and solely because it is the best there is in Vulcanizers at any price and because the price isn't much, the operation is easy and profits are exceptionally large.

Our machine is different, far better and more economical in operation and investment cost than any other made. In all features it is so superior to all other devices there is hardly a comparison. We have some facts that will interest you and that will put you in the way of big profits. In your own interest, get posted—Write to us to-day.

Auto-Tire Vulcanizing Co., Lowell, Mass.

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The
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Traction
Chains

Always have been. We intend they always shall be. Infringe NO Patents.

Have not reduced the number of cross chains to lessen our cost. When we can't give an honest chain, we'll quit.

Our Adjuster fits any size chains.

Let us tell you more about our goods and quote you.

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HORSEY

THAT'S THE NAME

ONE
MINUTE
REPAIR



USE
GASOLINE
ONLY

No Cement

No Acid

Inner Tube Patch

One trial of Horsey No Cement Patches and you will consign Cement and Acid Repair methods to the scrap-heap and be dollars ahead by doing it.

Automobile Kit, box contains 10 assorted patches, \$1.00.

Motorcycle (Vest Pocket) Kit, box containing 6 small patches, 50 cents.

Manufactured exclusively by

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**TEN EYCK
AUTOMATIC
TIRE PUMP**

Starts and stops by merely attaching the hose to the tire.

Write for Catalog
Auburn Auto Pump Co.
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This Lathe swings 13 1/4 in. over top bed, 22 1/2 in. thru gap, and the gap opens 18 in. wide.
The 5 1/2 ft. bed takes up to 64 in. between centers, while our 7 1/4 ft. machine takes 96 in. between centers when extended.
Just the thing for garage and repair work, and saves investing in a large expensive lathe.
The machine is built strong, rigid and accurate, and has all necessary accessories as shown.
Descriptive bulletin and price at your command.
Barnes Drill Co., Inc., 1907, 818 Chestnut St.,
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Builders of the All Geared Drill.

SEAMLESS STEEL TUBING

ESPECIALLY ADAPTED TO THE USES OF
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Also for a Great Variety of Mechanical Purposes
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EDGAR T. WARD & SONS
23-25 Purchase Street, - - BOSTON, MASS.



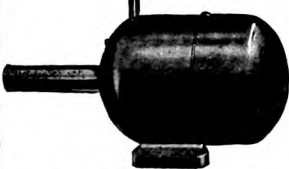
The Geysco No Cement Patch

For Patching Inner Tubes.

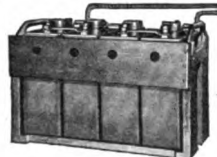
Requires No Cement or Acid to Patch Punctured Tubes.

The patches are the best and most practical on the market and by their use the patching of holes in the inner tube can be accomplished in but a very few minutes.
Only a few drops of gasoline need be used to prepare the patch for the tube.
Geysco No Cement Patches are especially made of the very best Para rubber and unlike most patches using the regular cement they do not work loose when the tire becomes heated.
These patches must first be used before their many advantages can be appreciated. They permit of speedy work without the bother and mess of using a cement. Eight Patches in package, containing full directions and fine sand paper, 75 Cents. **SPECIAL TRIAL OFFER, 2 Packages, \$1.00.**
444 Fimm Building, **Dayton, Ohio**
The Geyer Sales Company,

THE "H-C" LIGHTING DYNAMO

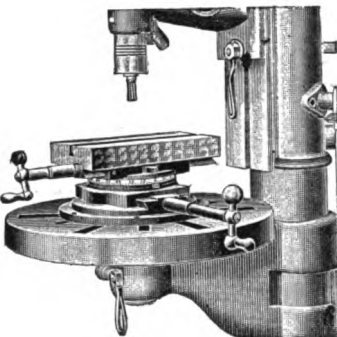


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NEW EDISON STORAGE BATTERY
furnishes the best and most efficient lighting system extant



for Automobiles and Power Boats.
NO RELAYS, INDICATORS, OR OTHER INSTRUMENTS REQUIRED
Send for Special Booklet No. 581.
THE HOLTZER-CABOT ELECTRIC CO.
BROOKLINE, MASS., and CHICAGO, ILL.

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Has Circular Base for clamping to any Drill Press Table, with Dove-tail Cross Slides, operated with Screws and Ball Cranks, by hand. Saddle is graduated and swivels to any angle. Table is slotted for clamping down work, Chuck or Vise. Handy for large shops, when the big machines are tied up, for spotting castings, milling off ends of bosses, etc.; for small shops that cannot afford expensive machines; diemakers, locksmiths, pattern-makers, repair men and automobile garages. It will cut key seats and mill cams. For use with end mill, fishtail cutter or formed cutters.
Write for Price.
MANUFACTURED BY
THE HINCKLEY MACHINE WORKS, Hinckley, Ill.

THE STRYKER MUFFLER CUTOUT

Last year he used a "Stryker" on his old car, and learned what a muffler cutout should do.

This year his new car was equipped with a muffler cutout—but he could see no difference when he used it—so he put on a "Stryker."

The "Stryker" materially increased his power, and reduced his gasoline consumption one-third.

Send for Booklet on Cutouts.
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Brown Impulse Tire Pump

PRICE \$15.00



Including—12 feet of hose, high grade recording gauge, and self-opening valve connection.

Don't pump your tires in the old way. Let your motor do the work. Simply insert pump in place of spark plug and run motor on low throttle. With one pump you can fit any car.

Let us send you our leaflet that tells how.
THE BROWN CO.
1100 S. Clinton St.
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TIRES. TUBES. TIRES.

STANDARD MAKES.

Highest grade stock, comprising of the best manufacturers. Cannot advertise names on account of the reduced prices we are selling them at.

Every tire is guaranteed brand new, perfect in every respect, and are not more than six months old. Some of these have the names of the makers on and others are buffed.

We thoroughly examine and test every tire and tube under heavy pressure to detect any weakness before shipping.

These are not the kind usually advertised. Nothing but the best stock is quoted in this ad.

Casings to fit Clinchers, Quick Detachable or Dunlop Straight Side Tires.

Size	Casing	Tube	Size	Casing	Tube
28x3	\$9.50	\$3.50	35x4	\$22.00	\$5.25
30x3	10.75	2.75	36x4	19.50	5.40
32x3	10.50	3.00	37x4	23.50	5.75
28x3½	12.00	3.00	32x4½	20.00	5.50
29x3½	14.50	3.15	33x4½	23.00	5.60
30x3½	14.50	3.75	34x4½	23.50	5.75
31x3½	15.00	3.75	35x4½	24.50	6.00
32x3½	15.00	3.90	36x4½	25.00	6.10
34x3½	15.75	4.15	37x4½	25.00	6.20
36x3½	15.00	4.25	34x5	20.00	6.00
30x4	16.50	4.60	35x5	25.50	6.25
31x4	17.00	4.75	36x5	26.00	6.50
32x4	17.50	4.90	37x5	28.00	6.75
33x4	19.00	5.00	37x5½	30.00	7.00
34x4	19.50	5.10			

Take advantage of these prices while they last, as we cannot guarantee how long these prices will stand good.

We guarantee these tires and tubes to be strictly 1910 and 1911 goods.

We are one of the oldest and largest tire and mail houses in the United States, and you do not have to hesitate to send us an order with cash accompanied, as we can refer you to any Commercial Agency or Bank in New York, as to our references.

We agree to refund your money if goods are found unsatisfactory upon receipt.

We Ship Goods Subject to Examination.

INSIDE TIRE PROTECTORS.



Prevent blow-outs, punctures, and greatly increase mileage. No need of throwing away old tires that are not worth repairing. Simply apply the inside tire protector and the old tire is given new life again and will add many miles of additional service. It covers the whole inside of casing to the head and is thus a blow-out patch extending all the way round. It is an acknowledged fact that 75% of all tires break down or blow out in the fabric before the rubber

is half worn out, thus losing half the mileage. These tire protectors are made from 3 to 6 ply of Egyptian fabric, with a self-seal flap reinforcing the rim and sides, always the weakest parts. We strongly advise placing these protectors in new tires, thus keeping them sound by releasing the strain, and the earlier a tire is equipped with them, the longer its life and the greater its mileage. Tube pinches are eliminated by the use of these protectors.

Order a complete set of them and save 100% on your tire expense.

Size	Reg. Price	Cut Price	Size	Reg. Price	Cut Price
28x2½	\$4.65	\$2.40	35x4	\$7.00	\$4.90
28x3	4.75	2.60	36x4	7.75	5.00
30x3	4.90	2.85	32x4½	7.25	5.00
30x3½	5.25	3.35	31x4½	7.50	5.10
32x3½	5.50	3.55	35x4½	7.60	5.25
34x3½	5.75	3.95	36x4½	8.00	5.50
30x4	6.20	3.75	31x5	8.10	5.60
31x4	6.25	4.00	35x5	8.25	5.75
32x4	6.40	4.20	36x5	8.50	6.00
33x4	6.60	4.40	37x5	9.00	6.50
34x4	6.75	4.75	37x5½	9.25	6.75

Owing to the fact that our profits are very small, we sell for cash only, and under no circumstances otherwise.

C. O. D. orders filled if 10% is accompanied with order, to show good faith.

Send for complete list.

EXCELSIOR TIRE CO.,

1777 Broadway,

New York City, N. Y.

DOVER AUTO FUNNELS

ARE THE STANDARD

56 Sizes and Styles



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CAMBRIDGE, MASS.



Buy Your Jacks Direct from the Factory.

Not long since we received an order for one thousand Jacks from one of the leading Auto Supply Houses.

Write us for our latest price list.

Vanderpool Bros.,
Springfield, Ohio.

PACIFIC COAST BRANCH:
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CABLE

Cuts Out All Uncertainty

MR. OWNER: Put it on your car and forget your ignition cable troubles—you'll have enough left to avoid lemonsomeness.

PACKARD CABLE lasts for years because it is effectually protected from heat, grease, oils and moisture.

FULLY GUARANTEED.

THE PACKARD ELECTRIC CO.
329 Dana Avenue WARREN, OHIO



"STAR" LATHES

9 in., 11 in., 13 in. SWING.

Suitable for fine accurate work in the garage, repair shop, tool-room and machine shop.

Send for Catalog B.

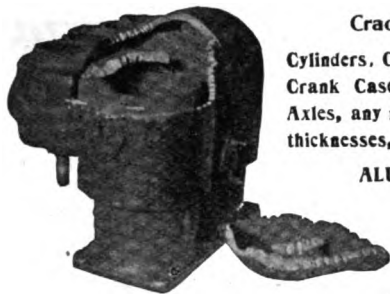
THE SENECA FALLS MFG CO.

429 Water Street, SENECA FALLS, N. Y.

A-1

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WELDING AUTOMOBILE PARTS



Cracked or Broken

Cylinders, Crank Shafts,
Crank Cases, Housings, Frames,
Axles, any metals of any shapes or
thicknesses, including

ALUMINUM PARTS

All work
absolutely
GUARANTEED

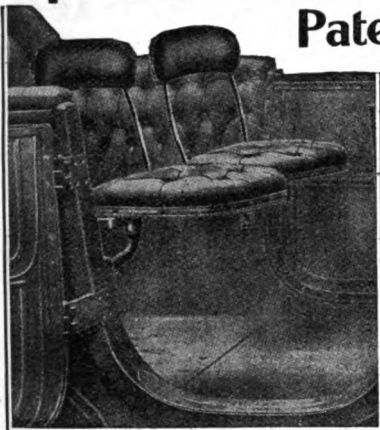
Manufacturers of welded (seamless) gasoline and oil tanks.

Write for estimates.

We also manufacture the only Oxy-Acetylene Welding Apparatus
allowed by the Underwriters Laboratories in insured buildings.

Western Welding & Mfg. Co., 557 & 559 W. Jackson Boulevard, Chicago, Ill.

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Made from steel drop
forgings; artistic in
design and finish;
compact, rugged and
durable.

A necessity of high
grade car equipment.

Write for catalog show-
ing various models.

Graves & Congdon Co.
AMESBURY, MASS.

The MAHER Duplex Multi



The Only Genuine Self Cleaning Spark
Plug on the Market.

21,000 Miles Without Cleaning.

Jobbers and Dealers, Write for Prices.

The Duplex Multi-Spark Plug Co.

Devil's Lake, N. Dakota

Pat. Feb. 7, 1911

HERE IT IS

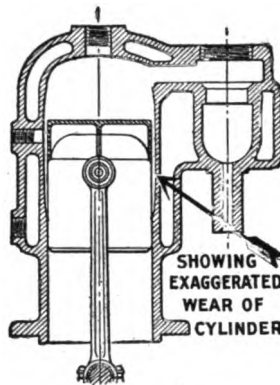


Don't ride on a Flat Tire.
Send 75c. (Money Order) for Sample.
The only **Puncture Indicator** made.
Gives instant warning of punctured tire.
Full instructions with each one.
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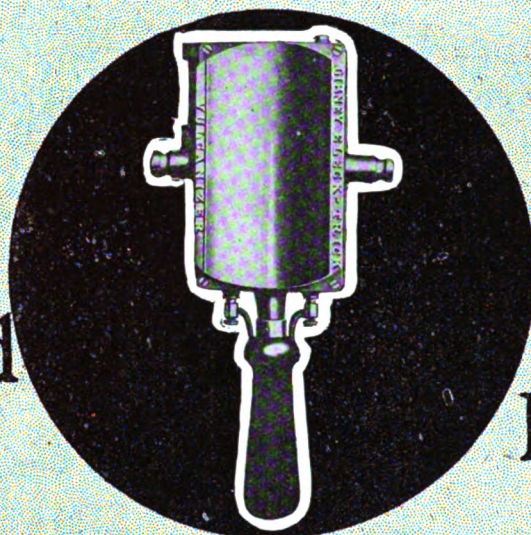
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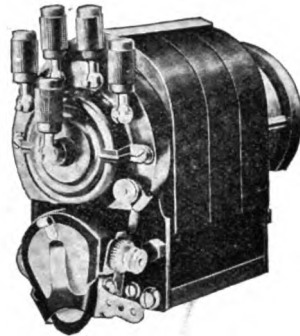


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"Perfect ignition. We never lifted the hood during the all-day grind. The Remy Magneto never missed a shot."

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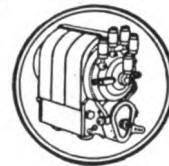
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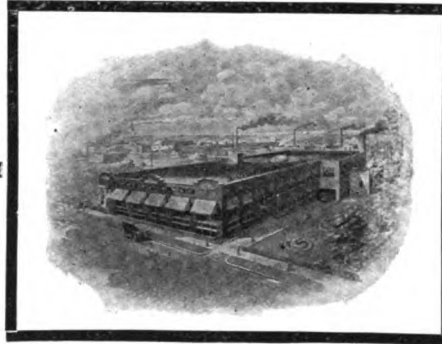
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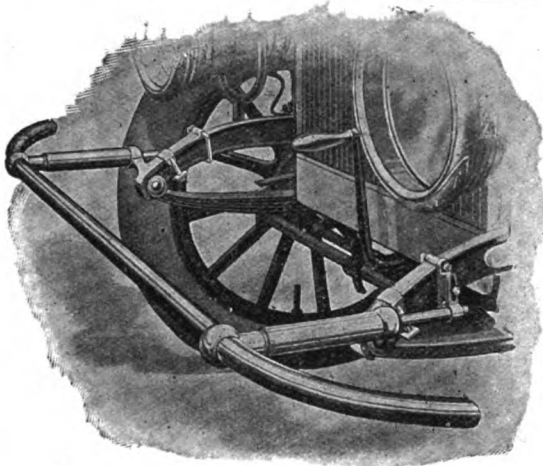
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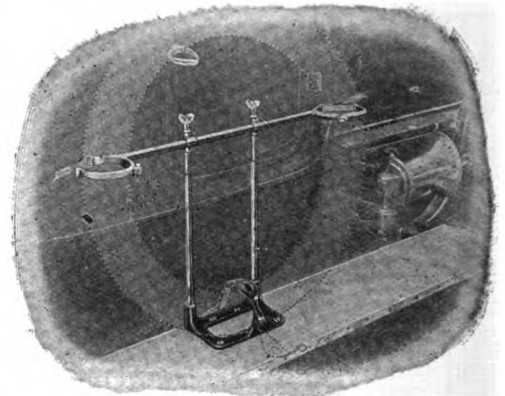


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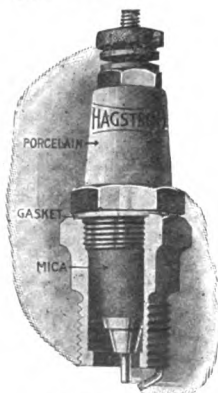


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PRICE, \$1.00

In this plug we eliminate the defects common to motorcycle plugs and present scientific construction and features strictly "Hagstrom."

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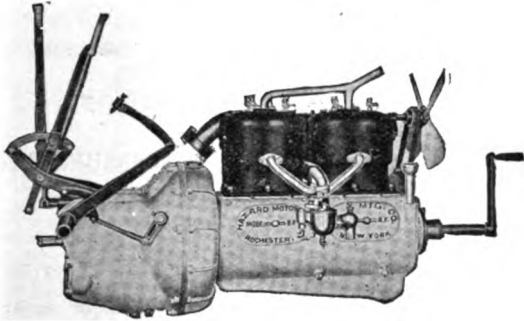
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An intensely hot igniting spark is furnished whether the engine is running one revolution or 2000. Impossible to stop in contact and a button is provided for starting on the spark.

SPECIAL ATTACHMENT FOR FORD CARS. CATALOGUE ON REQUEST.

In writing state make of car, size of time shaft, direction of same, and number of cylinders.

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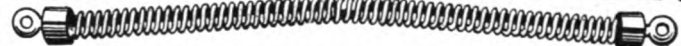
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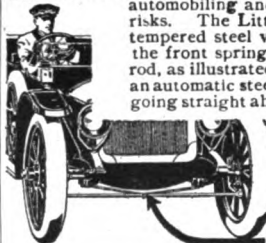
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Takes away all nervous strain and most all of the physical labor of steering.

It automatically keeps the car straight on rough, muddy or sandy roads, also when steering gear breaks or tire bursts. Increases the pleasure of automobiling and does away with or minimizes many of its risks. The Little Steersman is a coiled spring made of oil-tempered steel wire. The ends are fastened to the clips on the front springs of your car and the middle to the steering rod, as illustrated. It is then an auxiliary to the steering gear—an automatic steersman. The tension is such as to keep the car going straight ahead and always under perfect control. Still no extra exertion is required to turn corners.



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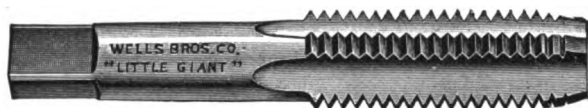
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Have you tried LITTLE GIANT taps?

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Accurate fits are necessary with automobile work. You can secure them with our taps.

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Little Giant.

WELLS BROTHERS COMPANY
Greenfield, Mass., U. S. A.

Mr. AUTOMOBILIST: Do you read the newspapers?

Of course we know you do. We only put the question to attract your attention. As you do read the papers and are fully posted on everything up-to-date that is going on, we wish to remind you of the articles which are appearing constantly in reference to correct air pressure in your tires. All the tire manufacturers are laying great stress on the importance of having tires pumped to the pressure that they advise, but in order to be sure you follow their directions you must have a good Tire Pressure Gauge.



HALF SIZE.

The SCHRADER UNIVERSAL TIRE PRESSURE GAUGE

has been submitted to every tire manufacturer in this country and we have their written approval of it. In most instances they tell us they consider it the best Gauge on the market. We are making this Gauge just as carefully as our sixty-six years of experience in manufacturing brass goods has taught us and every one of our Gauges is backed by our guarantee, so if you are not satisfied with our Gauge you need not keep it.

The great distinctive feature of the Schrader Universal Tire Pressure Gauge is that the pressure Indicating Sleeve remains exactly at the place it has been put by the air pressure in the tire when the Gauge is applied to the valve, thus making it possible to read the Gauge after it has been removed from the tire. After the pressure has been ascertained push the Indicating Sleeve back into the Gauge by the pressure of your finger. The construction of the Gauge is such that the Indicating Sleeve cannot be pushed beyond the proper figures, through sudden admission of air under high pressure into the Gauge. This feature is of the greatest importance. If you buy a Gauge you want to get one that is going to be right at all times. This Gauge records pressures accurately whether it is used with the valve at the top of the wheel or at the bottom.

Ask your tire maker, jobber or dealer to show you how it works. If they have none in stock enclose One Dollar in an envelope with your address and the Gauge will be sent you immediately by

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Descriptive circular on application.

THE IMPROVED HART GIANT PUMP THE BEST MECHANICAL DRIVEN TIRE PUMP



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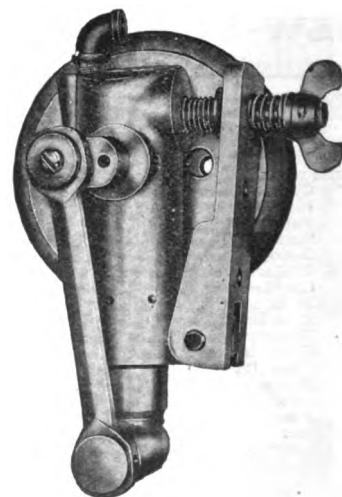
Let us explain *WHY* it is best. It is built in a machine shop by skilled machinists—construction best possible.

It is positively guaranteed for one year free from any mechanical defects and will pump 90 lbs. of air into a shoe in three minutes or less.

We challenge other pump makers to show any pump on the market to do the same amount of work as quickly and in as correct a manner as the Hart Giant Pump.

We ask readers to give us the privilege of giving them a full explanation.

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Directly applied to Fly Wheel

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Automobile Dealer and Repairer

A JOURNAL OF PRACTICAL MOTORING.

VOL. XI, No. 5.

NEW YORK, JULY, 1911.

PRICE { 10c. PER COPY
\$1.00 PER YEAR

HOW THE RUNNING IS SPOILED.

Little Things, but Often Put the Car in a Repair Shop Condition.

It is probably not an unusual circumstance that a trip in a car is to a large extent spoiled by little circumstances, nothing in themselves, but quite sufficient to take the keen edge off the enjoyment of the tour. In nine cases out of ten these troubles can be cured without much effort or great mechanical skill, but in some instances the writer has found that the trouble is allowed to continue, simply because the owner of the car did not know exactly what to do at the time. This must be the excuse for writing some things in the following notes which may, to those who are versed in motor car practice, appear rather obvious.

In some cases, when trying to start up the engine, it is found that it can only be accomplished by flooding the carburetor and then opening the throttle to its fullest extent. This is of course, quite effective, as the engine has by this means an abundant supply of gasoline. The trouble is that this very abundance causes the engine to race violently when once it is started, with very bad results both to the engine and to the occupants of the car. If there is any trouble of this kind, a good way to set about a remedy is as follows:

The carburetor should be flooded as before, and the throttle opened as before, but the ignition should not be switched on. The engine should first be swung over a few times in order to draw the gas into the cylinders. When this has been done, the throttle should be closed about halfway and then the ignition should be switched on. If this is done the engine will in most cases start off on the first pull up of the starting handle without the nerve-racking racing which is so objectionable.

It may be worth while mentioning in passing that the operation of flooding the carburetor should not be performed carelessly. Some people when they are in a hurry to start up an engine, get hold of the needle so viciously in order to flood the carburetor that they more often than not cause very considerable damage to the needle valve or the float. This of course results in leakage of the gasoline and the car is blamed for costing more to run than it would if it were treated properly. The flooding of the carburetor is so simple that it seems hardly possible that people could make such mistakes and damage their cars thereby. If done gently the flooding of the carburetor can be done quite as easily and simply as making wild grabs for it, and the car will not be damaged.

Too Much Oil.

The owner of a motor car will sometimes blame the maker for undue deterioration when the only trouble is insufficient overhauling. For example, after a car has been in use for some time, and has not been thoroughly attended to, it may be found that when the engine is required to pull on long hills, it runs quite well and yet the car does not seem to have enough power to make sufficient progress. It will probably be found that this lack of power is due to back pressure on the engine,

caused by the choking of the exhaust box and pipes. This is often caused by using a much too liberal supply of oil from time to time for the purpose of lubricating the engine; the oil carbonises and the deposit collects in the exhaust. It is advisable under such circumstances to take the exhaust box down, together with all the connecting pipes from the engine and thoroughly clean them out. When they are fitted up in position again it will in every probability be found that the car pulls as it should.

Not Enough Oil.

Very often trouble will be caused by the engine receiving an insufficient supply of lubricating oil, due to the fact that the pressure pipe of the lubricator which in most cases is fitted on the dashboard of the car, has become choked. Should this be ascertained the best way of quickly remedying the trouble, is to disconnect the pipe and to attach a motor pump to one end of it. By using this pump it will often be possible to remove the obstruction by the pressure of air behind it, and to clear the pipe immediately. If, however, the obstruction is refractory it can be tackled by slightly heating the tube with a blow lamp or a blow pipe. This will carbonise the oil inside, forming the obstruction and the soot can be knocked out. This will clean the pipe and when it is connected up again, it will be found to work as it should.

Too Much Gasoline.

Another little thing that very often puzzles the driver of a motor car who has not become thoroughly used to the ways of his engine, is that sometimes, when the throttle is opened, the engine takes a considerable time to pick up speed, and in some cases it may conclude to stop altogether. This is due to the fact that the engine has become choked through getting too much gasoline. As a rule this can be remedied by adjusting the air valve, but if, by doing so it is found that the engine is getting too much air to allow it to start when cold, the size of the jet in the mixing chamber will have to be reduced. It will be found that when this has been done the engine will pick up speed as it ought.

It will occasionally be found that the engine, while running, heats up unexpectedly, and there are several causes which might lead to this effect. It is quite possible that the engine may be getting too rich a mixture, that is to say, too much gasoline may be passing into the engine. This can easily be cured by adjusting the air valve so that more air may be permitted to mix with the gasoline and thus produce a weaker mixture. A second cause of overheating which is quite common is bad compression in the engine cylinder. This lack of compression can be put right by having the valves ground in thoroughly, and in all probability this will stop the engine from overheating. Yet a third cause, if the cooling water circuit is a pump driven one, is likely to be the faulty working of the pump. A leakage in the water circulating pump is not a thing to be allowed continuously, and it can sometimes be stopped by tightening the nut which is to be found on the end of the packing piece. If it should be found that this does not alter the

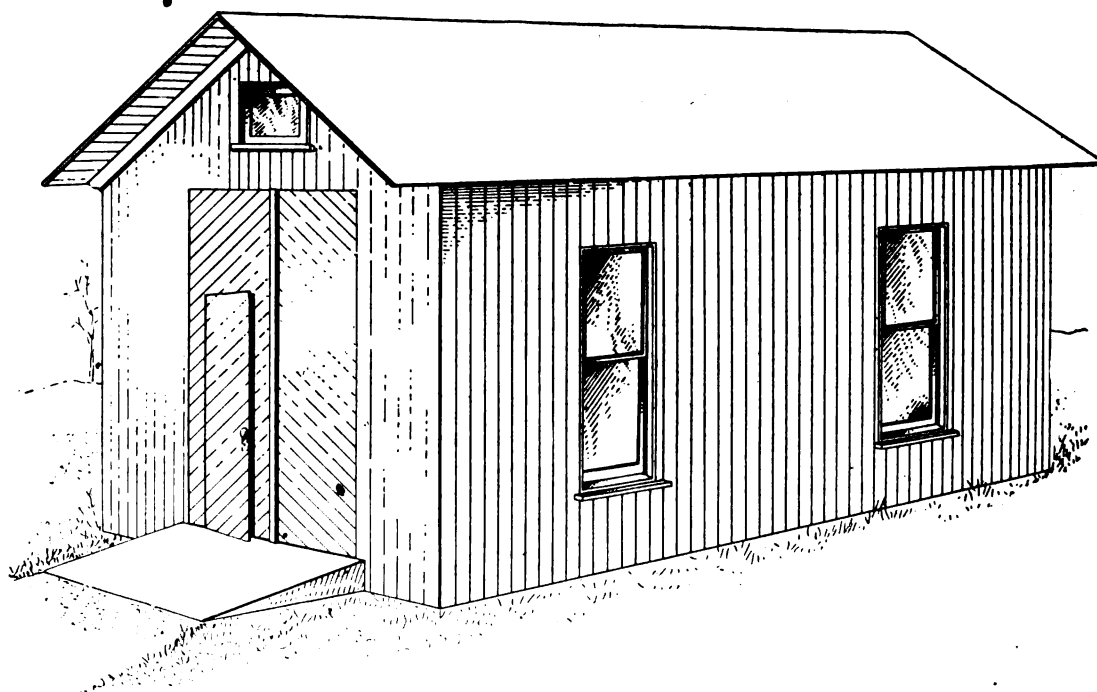
leakage, it is evident that the pump requires re-packing. This is accomplished by taking down the pump and taking it to pieces. While this is being done it is advisable, for the sake of ease in re-assembling the parts, to pop-mark the separate pieces with a center punch, so as to ensure its being put together properly again. The most convenient form of packing for the pump consists of tow and Russian tallow. If this, however, is not available a very useful packing can be made of asbestos string and gold-size.

Perhaps as a final word a reference to a very simple matter which, nevertheless, sometimes spoils an otherwise pleasant car ride may be mentioned. This is nothing more or less than trouble with the tail-lamp on the car, and subsequently trouble with the law and order representative. It is sometimes found, when it is required to use the tail-lamp that it either will not burn or that it is continually going out, which will probably cause inconvenience should a minion of the law make his appearance. The trouble is usually caused by soot forming in the chimney or head of the lamp, and it is advisable to have it thoroughly cleaned out after each time that it has been used on the car. In most cases this will alter the burning of the car tail light in a favorable manner, enabling one to do the driving of the car at night without any inconvenience from the tail-lamp.

The above notes all deal with very simple and elementary aspects of motor car engineering, but after all, is it not the simplest things which, for better or worse, have the most effect on our pleasures?

A Cheap Garage.

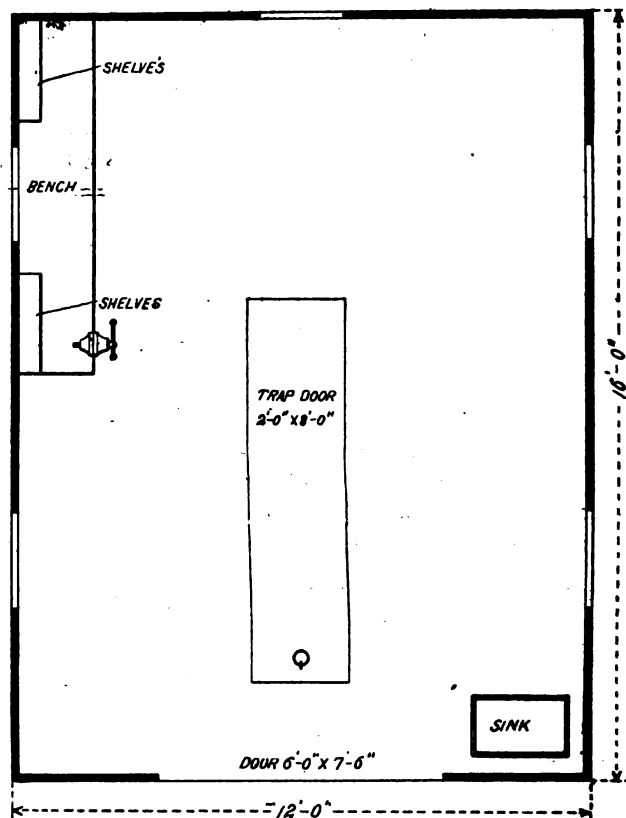
From L. H. Berg, Maryland.—I send to you drawings, showing plans and elevation, of a garage that can be built for the sum of \$125, which I think is cheap and substantial, but it is in no way fireproof, as you do not mention about it being fireproof.



Perspective Plan of a Cheap Garage.

In erecting this garage the piers can be either brick or concrete, and the floor sills can be undressed Virginia pine. The interior such as studding, corner post, rafters, flooring, etc., will be of No. 1 dressed Virginia pine or

cypress. The sides and fronts, including doors, will be of $\frac{7}{8}$ or 1 inch tongue and groove, with bead on both sides, or one side as preferred. The roof can be of a



Floor Plan.

cheaper tongue and groove, covered with cronolite paper, which is very substantial and lasting.

As I am not an experienced draughtsman but only an

automobile crank, I have made these drawings to the best of my ability and I sincerely trust they will meet with your approval and hope they will not be turned down.

GASOLINE CONVERTED TO POWER.

What Happens When the Mixture is Admitted to the Cylinder of the Motor.

"Most people," says William H. Stewart, Jr., of the Stewart Automobile Academy, in New York, have the impression that gasoline in its liquid state is explosive. Recent tests have shown that raw gasoline is quite harmless, except when exposed to the naked flame. Then the liquid will burn rapidly, but not necessarily explode. A lighted match may readily be extinguished by dipping it into the fluid if done quickly.

Gasoline tanks, such as used in automobiles may easily be soldered with the hot flame of the blow torch if the tank is partially filled with gasoline. However, if the tank is emptied of its contents, leaving enough of the fluid to form a gas, the tank at once becomes a dangerous bomb. In fact, a number of persons have been killed by not taking the precaution to empty the tank before soldering, not knowing they were thereby creating a greater source of danger.

Raw gasoline burns slowly. If it were not for the vaporizer or carburetor on the automobile engine, the gasoline would be practically useless. In other words, there must be a proper mixture of gasoline and air in order to get an explosion. This is the function of the carburetor, namely, to reduce the liquid gasoline to an explosive mixture.

If too much air is admitted and not enough gasoline a lean mixture is obtained. If too much gasoline and not enough air then a rich mixture results. In either case the motor will not approximate its horsepower. Not until the proper proportion is reached will it develop the greater efficiency.

Assuming that an explosive gas is obtained through the carburetor, it is quite easy to note how this is converted into power in the four cycle motor. The vacuum created by the piston travelling outward causes the gas to rush into the cylinder through the intake port or valve. This valve is timed to close when the piston begins to come down. The mixture thus inducted is compressed by the piston to approximately sixty pounds above that of atmospheric pressure, the compression differing as the type and size of motor differ. When this volatile mixture reaches the highest compression the ignition system is brought into action and the spark being properly timed, ignites the charge. The resultant explosion and expansion of the burning gases forced the piston outward delivering a rotary motion to the crankshaft.

The piston in its upward travel forces out the burned gases through the exhaust port or valve, which also is timed to open at the proper instant. After the cylinder is freed of the burned gases the same operation or strokes of the piston are repeated namely, (1) suction stroke, (2) compression stroke, (3) firing stroke, and (4) exhaust stroke.

Selling Motor Trucks.

The motor truck salesman must be supplied with sufficient information from the factory to reply to and refute any objection to the motor truck that may be made or any comparison of cost which a horse truckman may present to him. He should be advised of the progress in sales which his department makes, as well as advertising issued, and should secure information of the effect created by correspondence, circular distribution and other means of communication of which he may not be a part. He should be particularly serviceable in getting into personal contact with the party in each case who is certain to have the purchasing power, and should be adept in learning

whether there exists the disposition or the ability to make the purchase desired. There should be constant and complete communication between himself and the manufacturer, so that he may be assisted as well as assist in the conduct of every prospective sale.

In presenting his case to new prospects he should create the impression that he is solid and intelligent. Perseverance in the direction of convincing the purchaser of the utility and economy of the machine he has to sell, without introducing technical discussions or contrasts with the products of others, is valuable. The ability to make his prospects realize the advantage to be gained and the progress made by the use of his car can be cultivated with reasonable practice; an aid to this purpose is the reading of current literature on transportation, now so prevalent. Digesting current advertising, assimilating arguments and collecting facts for skilful use in the manipulation of intelligent, agreeable discussion is often a valuable accessory.

Curing Knocking and Overheating.

A reader says that during the past two years he has been troubled with an intermittent knock in the engine of his car. When it occurred a great deal of the power seemed to be lost, and hills which the car should take on fourth speed could only just be managed on second, and very often the water would boil as well. He had a new carburetor fitted, a new magneto, and the car overhauled by the makers and did not let the matter rest for the want of any reasonable expenditure.

Eventually the trouble was found to be due to two things. It was suggested that the occasional overheating was due to some loose impediment which occasionally blocked the water pipes, and upon removing the main water pipe from the pump he found this contained lumps of loose solder apparently worked through from the radiator. This main pipe has four branches leading to the separate cylinders, and these branches are of considerably smaller bore than the main pipe, so that the solder was at times forced into the small branches, blocking one or more or restricting the water supply and causing the overheating. At times the solder would fall back into the main pipe, in the same way as a piece of foreign matter in a petrol jet will fall back into the larger bore and cause no restriction of the supply for a short period.

Prolonged trials showed that the overheating was cured. But not so the knock, which was as bad as ever, and the irregular running also continued. Further investigation indicated that the timing wheels and exhaust camshaft bearings had at some time been short of oil, for the camshaft bearing at the front end had apparently seized partially and torn badly, and this had had the effect of putting so much additional strain upon the keyway of the half-time wheel that it had stretched to an extent that allowed a great deal of slackness or back lash. Consequently the exhaust valves sometimes opened late and sometimes too early, at other times correctly—for the camshaft was not, strictly speaking, loose in the wheel, so it might have held any particular position for some time.

Fitting a new key and renewing the torn bearing has made the car as quiet as ever, and although the engine does not pull quite so well as at one time, this is no doubt due to the fact that he has in the course of his experiments upset the adjustment of the carburetor. A little tuning-up will, no doubt, set this matter in order also.

THE INDUCTION COIL.

A Careful Study of the Principles Involved in Its Use and Construction.

BY SYDNEY F. WALKER.

Number 2.

The induction coil has received a good deal of attention, but in the writer's view, it is hardly as well understood as it might be; and he is of opinion that by a careful study of the principles involved in its construction, considerable saving in current might be obtained. The induction coil, it will be remembered, is employed to raise the pressure furnished by the battery, usually about 4 volts or less, to that required to drive a spark across between the platinum points of the spark plug, from 6000 to 10,000 volts. The induction coil is really a transformer. In fact, the transformer which is so largely used in the distribution of electric current from alternating current generating stations, is really a modification of the induction coil.

induction coil, is intended to perform the same office as the reversal and change of the value of the current in the alternating current service. The *modus operandi* is as follows: The current is flowing through the primary coils, and is suddenly broken by the action of the contact breaker, or other device. The cessation of the current in the primary coil, has the effect of inducing a current in the secondary coil, in the opposite direction to that in which the current in the primary coil was flowing. When the primary circuit is again completed, a current would flow in the secondary, in the same direction as the primary.

The matter may be looked at in another way. When a current flows through the primary, lines of magnetic force are projected out into space, forming cylinders surrounding the primary wires; and when the primary circuit is broken, the lines of force are extinguished. Or again the matter may be looked at thus. When the primary circuit first commences to flow, energy is projected outward to form the lines of force, and they are maintained by a charge upon the flowing cur-

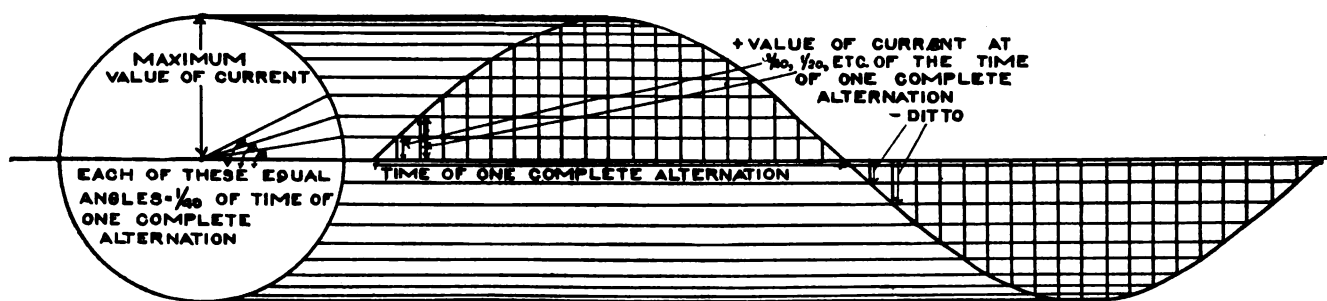


Fig. 11—Showing diagrammatically the variations in the value of an alternating current.

It is made very large, but the principles are exactly the same. In the distribution transformer for electric light and power, the same parts are present, with one important omission, as in the induction coil. There is an iron core which is divided up as much as possible, and two coils of wire, known respectively as the primary and secondary, one being very much longer, and having very many more turns than the other. Roughly, the number of turns in the two coils bear the same relation to each other, as the ratio of transformation.

In the induction coil, there is an iron core, again divided up as much as possible, two coils, the primary and secondary, but in addition, there is always some apparatus for breaking and making the primary circuit. In town distribution by alternate currents, this apparatus is not necessary, because the current itself is continually changing in value, and reversing in direction. Probably a clear understanding of the working of the town distribution transformer, will aid in understanding the working of the induction coil. In the transformer, the primary current rises from 0 to a maximum, falls to 0, rises to a maximum in the opposite direction, falls to 0, again rises to a maximum in the first direction, and so on. The current in the secondary coils follows that in the primary, but after a slight interval, and they are of the opposite name to those in the primary. Thus, when the currents in the primary coils are in what may be termed the positive direction, those induced in the secondary are in the negative direction, and when those in the primary are in the negative direction, those induced in the secondary are in the positive direction. Fig. 11, shows the changes in the value and direction of alternate currents used in town distribution. The contact breaker, or other circuit breaking device employed with the

rent. When the current ceases, the energy which has been maintaining the lines of force around the primary conductors, returns to them, and in so doing, creates an electrical pressure in any conductor in their path. The wires of the secondary coil being in their path, an electrical pressure is created in them. The pressure created increases with the number of turns of the coil, because the lines of force in retiring to the primary conductor, cut each individual coil, in practically the same way, and approximately deliver to each coil the same amount of energy. This is the reason why the ratio between the number of turns of primary, and the number of turns of secondary, is approximately the multiplying ratio of the coil, the ability it possesses to multiply the pressure of the primary source of current. The magnetism created by the primary current, depends directly upon the strength of the current itself, and upon the number of turns it makes around the iron core.

This is not quite the whole story. In addition to the simple action between the primary and the secondary, the simple increase of pressure in the secondary, above that in the primary, there is a reaction between the secondary and the primary, and there is also what is called self-induction, and what Faraday called the *extra current* in the primary itself. Whenever an electric current is flowing, any change which takes place in its strength or direction, causes a change in the magnetic field surrounding it, and produces a certain effect upon any conductors in that field. Every current flowing in a conductor, when it first commences to flow, when it ceases to flow, and when any change occurs in its strength or direction, gives rise to changes in the magnetic field in its neighborhood. It does not matter how the current takes its

being. The current in the secondary coils for instance, behaves exactly as if it came from the same source of current direct, as the primary current. Every change in the strength of the secondary current creates changes in the magnetic field in the neighborhood of the induction coil, and these changes react upon the

and paraffined paper for the insulator. An electrical condenser has the peculiar property of storing electricity, and giving it up again when required. An electrical condenser may be defined as being formed when any two conductors are separated by an insulator, and the two are connected to some source of

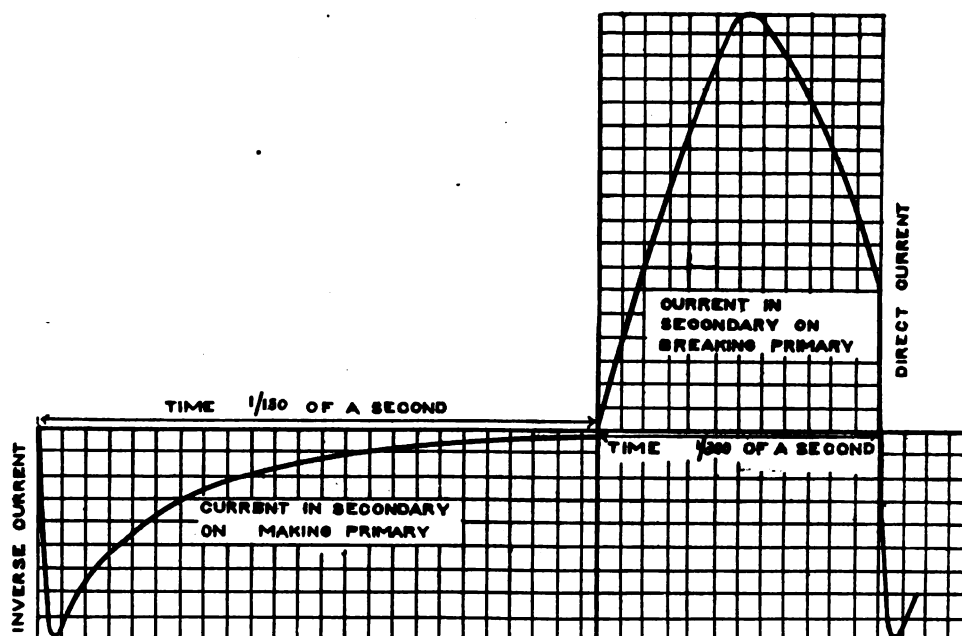


Fig. 12—Showing diagrammatically the changes in the secondary current of an induction coil.

primary wires. Fig. 12, shows approximately the changes in the value of the secondary current in an induction coil.

In addition to the effect produced upon the primary coils by the changes in the secondary, the cessation of the current in the primary, causes self-induction and a rise of pressure in the primary coil itself. This would lead to reduction in the efficiency of the induc-

electricity having a difference of pressure. Thus, nearly all cables employed for distributing electricity for light or power, are condensers. The copper conductor on the inside, the insulating covering, and the lead covering which is often used, or the armor which is nearly always present, together form an electrical condenser. When one terminal of a dynamo is connected to the conductor, what is called an electrostatic

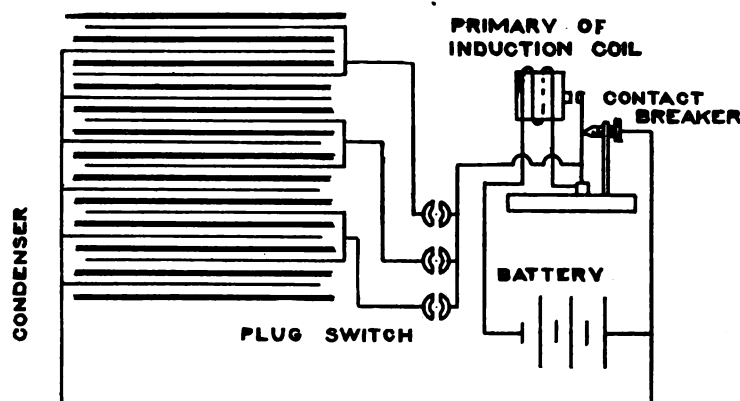


Fig. 13—Diagram showing the arrangement of the condenser across the make and break of an induction coil.

tion coil, to a reduction in the multiplying pressure of the secondary coil, if it were not absorbed.

In all induction coils used for ignition and similar work, what is called an electrical condenser is bridged across the gap at the contact breaker, the gap which occurs when the contact is broken. A condenser consists of a series of metal plates usually placed one on top of the other, and separated from each other by some insulator. The common form for induction coils for ignition work is tin-foil for the metal conductors,

charge passes into the condenser formed by the copper, the insulator, and the lead or armor. It is as though the insulator absorbed electricity, just as a sponge absorbs water. The charge remains in the insulator, as long as the pressure which delivered it remains unchanged. If the pressure increases, the charge increases, and vice-versa. Hence, when the pressure is removed, the charge flows out of the condenser, and into any conductors that are connected to its plates. The several sheets of tin-foil and paraf-

finer paper used in the condenser of an induction coil, are employed because of convenience, and because a comparatively large capacity, as it is termed, can be provided in a small space. When the contact breaker opens, the additional pressure which is created in the primary coils, owing to the return of the energy from the magnetic field to the conductors from which it emanated, in place of being expended entirely in the primary coils, is employed largely in storing a charge in the condenser. When the pressure created by the break ceases, the charge flows out of the condenser into the primary coil, and assists to re-create the magnetic field. Fig. 13, shows the arrangement of the condenser diagrammatically.

The whole action of the induction coil is really a very complicated affair; but certain important points may be mentioned. One is that the current should flow through the primary coil for as long a period as possible, consistently with providing the necessary break at the right moment, and the break in the circuit of the primary coil should be very quickly done.

The spark which passes between the platinum points in the spark plug, is by no means what it seems. It looks like a flash, like a current passing in one direction, and then finishing. Careful experiment has shown that it is nothing of the kind. What is apparently a single spark, is really a series of oscillations, each producing a certain portion of the spark. The action is very much the same as that of the pendulum. It will be remembered that the pendulum, if it is pulled on one side of the vertical, swings to a certain distance on the opposite side of the vertical, returns to the vertical, and swings again to nearly the position it started from, again swinging to nearly the same angle as it did at first, the swings being gradually less and less. Precisely the same thing takes place with the spark. It consists of a current passing first in one direction, followed by another in the opposite direction, a little weaker than the first. The second current is followed by a third in the same direction as the first, this being again a little weaker; the third by a fourth current, and so on, the currents being gradually less and less. This fact, that the spark consists really of a series of oscillating currents, has rendered it exceedingly difficult to take accurate measurements, showing the efficiency of the induction coil as a whole.

(To be continued.)

WORM GEARING.

Some Essentials for Its Successful Working and Some Errors as to Friction.

Among the various devices at present under consideration for adoption by manufacturers of motor cars, worm gearing occupies a prominent place, and the most important question in this connection is the relative mechanical efficiency of worm and bevel gearing. It is, however, doubtful if mechanical efficiency in itself be a correct premise, for the efficiency of gearing for motor car purposes is a figure of merit arrived at from a formula in which the factor of silence has a high value, and this renders an otherwise fairly equal contest favorable to worm gearing in result.

The engineer, so far as gearing is concerned, naturally seeks to avoid anything in the nature of sliding or rubbing contact, and, until comparatively recently, this evasion was justified. Yet the problem of sliding surfaces is one that presents itself to him every day, as when dealing with plain bearings, pistons in their

cylinders, etc. Satisfactory results are obtained in these examples by making the surfaces in contact with each other of suitable material and providing for efficient lubrication. In dealing with the sliding contact of worm gearing, it is obvious, from experience of other sliding mechanisms, that the surfaces in contact—the worm and worm wheel—should be made of the most suitable materials, and this is only of secondary importance to efficient and sufficient lubrication.

It has been claimed as a fundamental principle of lubrication that by the interposition of a layer of oil between two rubbing surfaces the particles of oil form minute rollers or balls, and so convert sliding into rolling contact. This theory may be correct, but so also may be the theory that the action of the oil is to render smooth two surfaces of minute cavities and projections by filling up the cavities. It is well known that the smoother two surfaces in rubbing contact are, the less friction there is, and it is conceivable that there would be no friction at all between two rubbing

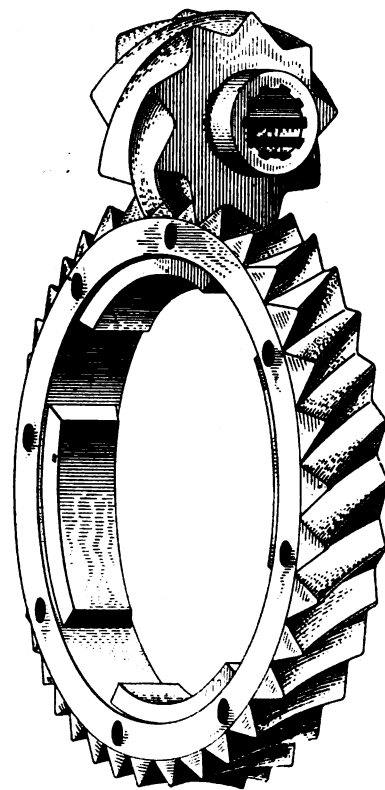


Fig. 1.—One form of worm gearing showing a gauge for the space between the teeth of the wheel in the corner.

surfaces if they could be made infinitely smooth. It follows, therefore, that in worm gearing, where the contact is essentially a sliding one, the importance of smooth surfaces is great, and, accepting the second mentioned theory of the action of lubricants as the correct one, the final degree of smoothness must be attained by liberal lubrication.

This question of lubrication has a very important bearing on the subject. It is admitted, as an essential to successful working, that the gearing should run in oil, but whether the worm should be placed below its wheel and therefore submerged in oil, or whether it should be on top of its wheel and get its oil indirectly, is a point upon which designers are not yet in agreement. Other things being equal, the underneath position is undoubtedly the better of the two from the point of view of lubrication. But other things are not

quite equal, for the immediate advantages of having the worm on top are many. The drive may more readily be almost in line with the engine, and the ground clearance is much greater, and if the likelihood of lubrication troubles arising were greater with the overhead worm its advantages would almost warrant the use of an oil pump. It has been proved that worm gearing with the worm on top can be constructed to work without giving trouble.

Among the laws regarding friction there is one which is, in effect, that friction is independent of the area of the surface of contact, while another law sets forth that friction is directly proportional to the pressure between the two bodies in contact. It is evident that if the surface of contact be reduced, while the load remains constant, the pressure will be increased. Obviously, therefore, in worm gearing, the contact surface of the teeth should be as great as possible.

A form of worm and worm wheel used in England are shown together in Fig. 1. The wheel is made of a special bronze, and the worm of hardened steel. The surfaces of the teeth are, in both cases, extremely smooth and highly polished. There are nine teeth in the worm and thirty-four in the wheel, the helical angle of the wheel being 44 degrees, and consequently that of the worm 46 degrees. These gears are made by special patented machinery. The gauge in the left-hand corner of the illustration is of the normal space between the teeth of the wheel; that is to say, it exactly fits between two of the teeth if placed in the space at right angles to the angle of the teeth, and in the present instance provides some idea of the shape of a normal section of the tooth, or an exact idea of the shape of the cutter. As will be seen, the tooth is triangular in section.

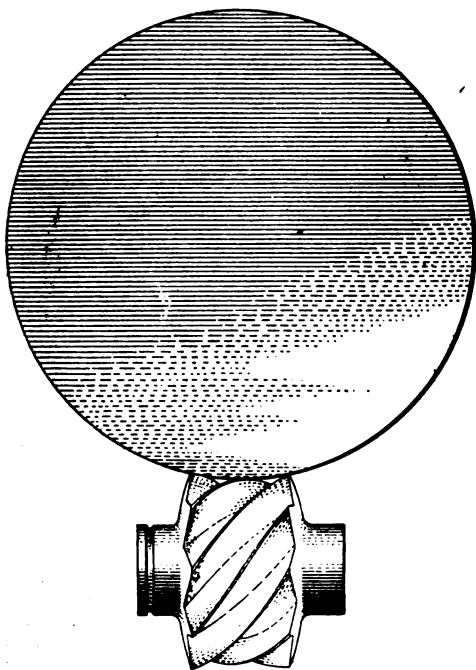


Fig. 2—Showing the worm surmounted by a disc representing the root circle of the wheel.

In Fig. 2 the worm is shown surmounted by a disc. This disc is of the same diameter as the root circle of the wheel, and the object of this illustration is to show how the worm is made to embrace the wheel.

Helical gearing conveys a notion of what are virtually multi-thread screws. For example, the worm shown is a nine-start V-thread screw, and two such worms, subject to clearance and angular laws, would

run together as a worm gearing—that is to say, with their axes at a given angle to each other, but they would present to each other two convex surfaces, and the utmost extent of the contact between them obtainable would be a line contact from the top to the bottom of the tooth. Obviously the only possible shape which will make more than point or line contact with a convex surface is a concave one, and in the illustration Fig. 3 the wheel is shown with a straight

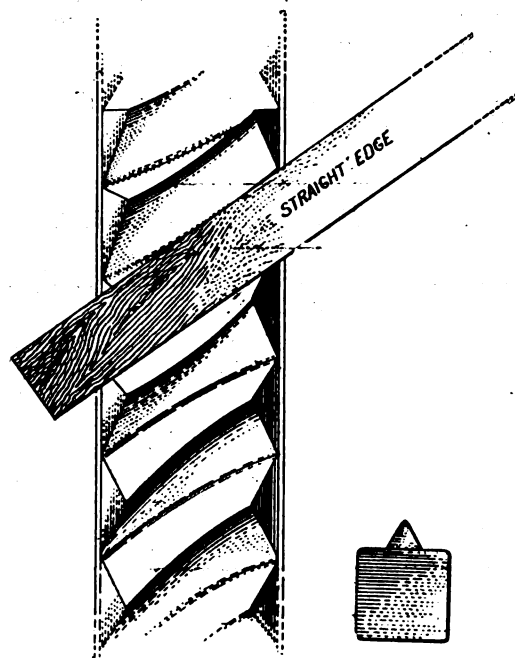


Fig. 3—Showing a form of worm wheel with a straight edge set on the face of a tooth, showing the concave form of the latter.

edge placed upon one of the teeth, and it will be seen that the face of the wheel tooth is concave, so that this essential for surface contact exists. In these particular gears it can be shown that surface contact takes place by coating the teeth with some coloring matter and bringing them into contact; on separating them it will be found that the coloring matter has been removed from a very considerable surface.

As regards the method by which these worms and wheels are manufactured, and the composition of the material of the worm wheel, precise details are not available, but, broadly speaking in regard to the former, it may be said that the teeth of the wheel are cut by a cutter similar to the worm, and the teeth of the worm by a cutter similar to the wheel. The cutter and blank are run together, the feed being radial in direction and the turning movement of the blank being positive or "permissive." For worms and wheels of different gear ratios different cutters are used, but the same machine will take different cutters.

Apart from worm and worm wheel and the material from which the latter is made, there are other important elements in the construction of a successful worm gearing. Ample provision must be made in the mountings for the end thrust of the worm and the side thrust of the wheel, and, as in motor car work, reversing, both in action and in direction, takes place, this provision must be made in duplicate. In addition, owing to the shape of the teeth, careful attention must also be paid to the radial bearings of the worm and wheel shafts.

The purely mechanical efficiency of worm gearing depends on the helical angle of the teeth. The angle

of highest efficiency is 43 degrees 34 feet and to obtain the higher efficiencies the angle must be between the limits 31 degrees and 55 degrees.

As an indication of the mechanical efficiency attainable by the use of worm gearing, a complete back axle of the form illustrated was subjected to test before the adoption of this type by the Deimler Company, and the overall efficiency was stated to be 87 per cent.

Regarding the wearing qualities of this type of worm gearing, a life of 60,000 miles is known of, but records are difficult to obtain, and it is thought that gears which have exceeded this distance are still running. In cases where the teeth have become worn through neglected lubrication it is found that the quietness of running is not lost—a very different result from that obtaining in the case of a worn bevel gearing.

A NEW SPEEDY RUNABOUT.

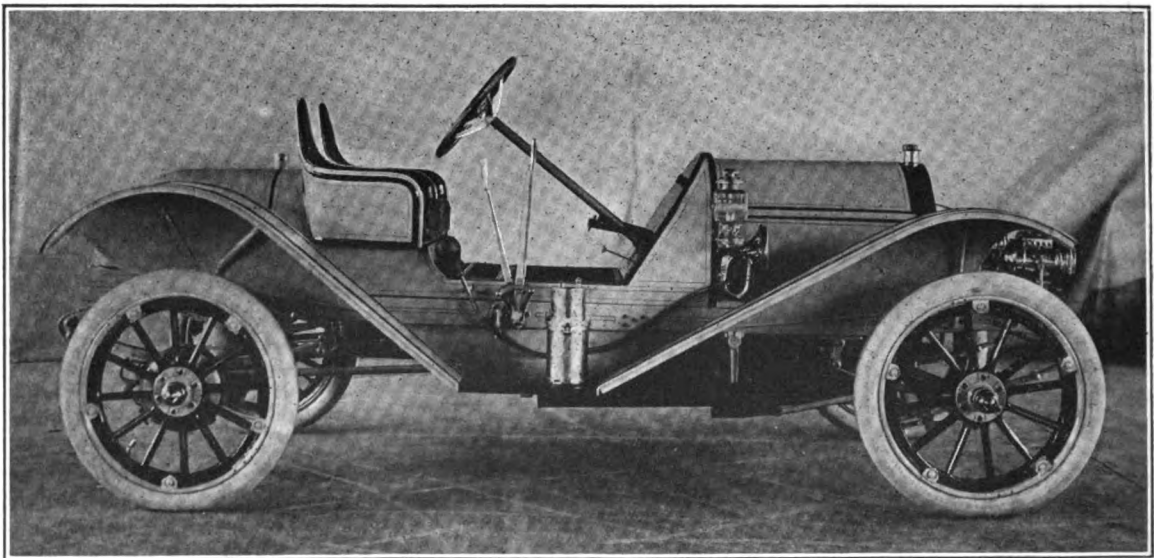
Guaranteed for One Year and of the Most Up-to-date Construction.

Many prefer to buy a rather low priced car as a first purchase, and then when they become thoroughly familiar with its running and mechanism, to dispose of it and purchase something faster, better and far more enduring. The idea is not a bad one. Few are permanently satisfied with a low priced and inferior car if they can afford a better one, and in most cases the high priced car is quite as economical in the long run and

of speed. The wheelbase of 104 inches gives a long, low appearance in which the 32-inch wheels aid materially.

The motor is four-cylinder, 3.75-inch bore and 4.5-inch stroke, rating at 22-26 h.p. The cylinders are cast in pairs with large water jackets. All valves are placed on the left side, driven from a single camshaft and enclosed for noiselessness. Ignition is by magneto, placed at the rear end of the left side and close to the fly wheel and clutch housing. Just in front of this is located the water pump, while the front end of the same longitudinal shaft provides a fan drive. The carburetor is a Schebler, while the magneto is a Bosch.

Lubrication is by self-contained pump circulating system and splash. The arrangement of this is such as to provide for the clutch lubrication as well, the latter being enclosed with the flywheel in a unit, which is three point suspended from the frame. The two rear points are the ends of a cross tube, while the front is on the underside of the crank-case. This clutch is of the multiple disc type. Three speeds forward and a reverse are afforded by the transmission, which operates on the selective plan in an H quadrant. From the gearbox the drive is by propeller shaft, enclosed in heavy torque tube, to the semi-floating type of rear axle. There is but one universal joint in the driving shaft. The axle is enclosed in a specially constructed pressed steel housing with inspection plate. The front axle is of the I beam section and is a one-piece drop forging with spring seats forged integral.



G. J. G. Junior Runabout, made by the G. J. G. Car Company, White Plains, N. Y.

gives better satisfaction in speed and running qualities, to say nothing of upkeep expense.

The G. J. G. Junior runabout just put on the market by the G. J. G. Car Company, White Plains, N. Y., is made to supply the need of those who desire a small car that will be permanently satisfactory, that will compare favorably in speed, class or appearance with anything on the road, no matter what the cost, and that is within the reach of those who are able to pay a medium price and yet want to get the most for their money in material, use and appearance. The body is of the classy runabout type, with two bucket seats, these having but a partial back. The shape of the car was designed to minimize air resistance and dust suction and to be pleasing to the eye. The long, wide, flaring fenders are constructed to carry out the lines

Semi-elliptic springs are used in front and full elliptic with scroll ends in the rear. The fronts are shackled at the rear end. This springing, combined with the 32 by 3.5 tires all around, makes for easy riding. Steering is by a worm type of gear with 18-inch hand wheel, located on the right side. This is set at a sufficient angle to carry out the idea of a speedy car.

Brakes are located in the rear hubs, and operate on 10.75-inch drums. The wheels are regularly equipped with Dorian quick detachable remountable rims. Other equipment includes extra rim, gas head lamps, generator, oil side and tail lamps, horn, muffler, cut-out, tire repair kit, oil can, pump, jack, and roll of special tools. The standard color is French gray with a black stripe, and the upholstery, black genuine

leather. The car is guaranteed for one year. The material—something the purchaser is usually in the dark about—is as good as money can buy. The price, fully equipped is \$1,000.

LONG STROKE MORE EFFICIENT.

An Automobile Engineer Gives Practical Reasons for His Conclusions.

Among the many papers presented at the meeting of the Society of Automobile Engineers in Dayton, Ohio, was one by Justus B. Entz on "The Question of Long versus Short-Stroke Gasoline Engines," and he decides in favor of the long stroke motor as possessing greater efficiency. He says:

In considering the relation of bore to stroke in an automobile gas engine we may assume that at 1000 revolutions per minute the power obtained will be proportional to the piston displacement, and that a $4\frac{1}{2}$ by $4\frac{1}{2}$ and a 4 by $5\frac{3}{4}$ will give equal power. If each engine is designed for the same percentage of compression space, and has valves proportional in size to the bore, we find that the shorter stroke engine has a total pressure on its piston head of $5\frac{3}{4}$:- $4\frac{1}{2}$, or 26 per cent more than the longer stroke engine, and that as the crankshaft and connecting rod bearings turn but once in their boxes per revolution, whether the stroke be long or short, that the loss in them is increased.

The side pressure of the piston on the cylinder walls is also greater in the same proportion, but as the piston speed is correspondingly less, this loss will be about the same in each. But the result is a higher mechanical efficiency for the long stroke. The piston in the long stroke is lighter, being less in head and wall, but the speed being higher the balance of the two engines at the same revolutions per minute will probably not differ much.

The wall area of the compression space is less in the long stroke, and its thermal efficiency is higher therefore, as well as its mechanical efficiency. The torque of the long strike is higher at low speeds due to its higher thermal efficiency which is lowest at low speeds.

At high speeds, however, as the same volume must be driven through smaller valves, the long stroke will have a less volumetric efficiency, if the valves are small enough to be the limiting factor, and therefore will lose power at high speeds. But in practice even in engines of 40 per cent. longer stroke than bore, the carburetor generally determines the volumetric efficiency rather than the valves.

It is, of course, a question as to how much the stroke can be increased as compared with the bore and give better results, but I believe that engines with a stroke relation to bore of from 1.4 to 1.5 are lighter, more efficient, and more flexible than shorter stroke engines.

Speed in Relation to Tires.

Mr. H. S. Firestone favors racing as an aid to perfection of tire manufacture. Whether the strength and durability of tires cannot be as well tested by some other method is open to question, but what this enterprising tire manufacturer says of the wear of tires in relation to speed is important:

"Motor car racing is by all odds the severest test a tire can have, as it is a scientific fact that high speed shows up all the strength or weakness of a tire. This is especially true of track and speedway racing, on account of tread wear in rounding curves. Every additional 5 miles of speed after a car exceeds 40

miles an hour, cuts down the possible mileage anywhere between twenty and forty per cent., so that by the time the car reaches 75 miles an hour, as did Ray Harroun's winning Marmon, the tires can be reasonably expected to give only about four per cent. of the actual mileage they would show in good fast everyday service."

It is a fact, and should be considered by all who wish to get the best and longest service from their tires, that fast speed ruins more tires than any other source. Mr. Firestone speaks of 40 miles an hour, but even at a speed of 25 miles an hour, tires will not give much over half the service than if constantly run but 12 miles an hour.

The Doctor's Chauffeur.

Here is a true story from St. Louis, and the moral is obvious: A family had an automobile which they used every evening in the week, going out for a jolly ride. The sweetheart of the young lady of the family, always drove the car, and it finally became known that the car was his. She was the subject of much congratulation and an equal amount of envy throughout the neighborhood at her good luck in capturing so desirable a young man with an automobile. Incidental to the story, there is a doctor whose name is not Jones, but that will do, who uses an automobile in his practice for visiting patients, but who never uses his car at night. The doctor employs a chauffeur to drive for him.

One night recently Dr. Jones made a social call for a game of cards and a smoke on a friend. He went to the window for a stretch, and saw the automobile belonging to the people across the street before mentioned.

"I see you have an automobile across the street. It is the same make as my own. Who owns it?"

"It belongs to the sweetheart of the young lady who lives in that house," answered his friend.

"Hum," said the doctor, "that's the most familiar looking car I ever saw. It's the same model as my own. I believe it is my car." With considerable haste he slipped out and took a look at the license number, and it was his car. Returning to his friend's house, he telephoned to the garage where his car is kept and asked the night man if his car was there.

"O yes, sir," the night man assured him. "Yes, indeed, sir, it's here."

"I don't want any guess work," said the doctor. "You go and see if it is there and then tell me."

The night man returned to the telephone in a few minutes with the rather weak-voiced statement that the car was not in, but he said, "I can give you the telephone number of your chauffeur."

The doctor called this number and glancing across the street at the same moment, he saw through the open, well lighted window of the house opposite, his chauffeur pass to the telephone.

"Hello," he said, "is that you, Jim? This is Dr. Jones. Where is my car?"

"Why," answered Jim, "it is here where I am. I had to get a tire fixed up on it, and I stopped on my way to see some friends before I took it back to the garage."

"Well, stay right where you are until I call you again," said Dr. Jones. The doctor then called up the telephone number of another chauffeur, and told him to report at once to go to work.

In the meantime, Jim had gotten scared, and coming out of the house was standing in front of the car

when the new chauffeur, who had been directed to do so by the doctor, came across the street and innocently began to crank the car.

"What in the blankety-blank are you going to do to that car?" said Jim, who scented an automobile burglar, and squaring off for fight.

"I am going to drive it across the street to Dr. Jones," said the new man calmly. "That's him looking out of the window upstairs there."

Jim took one look up at the lighted window where, silhouetted, stood the well-known figure of Dr. Jones. He turned and walked down the street at a rapid pace and has not even called on the doctor for the unpaid half week's wages due him.

IGNITION TROUBLES.

Spark Plugs, Timing Rods, Testing, Shaking Cars and Balancing the Motor.

BY JAMES F. HOBART, M. E.

The other day I rode in a car which had the appearance of a very fine piece of automobile work but which gave an impression of being unfinished somewhere after one had ridden a few miles in it. A trip of about ninety miles was also made—in another car—which gave the driver all kinds of ignition troubles and necessitated stopping at least six times during the ride to hunt and catch "trouble bugs."

The writer determined during this ride, that when dealing with automobiles under his care to work upon a regular system and never be obliged to use the "hit or miss" system or rather lack of system employed by the gentleman who drove the car noted above. Whenever misfiring occurred—and that was all too often—the gentleman would get down at the engine and hunt aimlessly, one thing after another, until he had located the trouble.

Instead of this haphazard method, work out a regular system for finding ignition troubles and then stick to that system until you can work out a better one. The great majority of ignition troubles may be divided into two classes—troubles of the spark plug

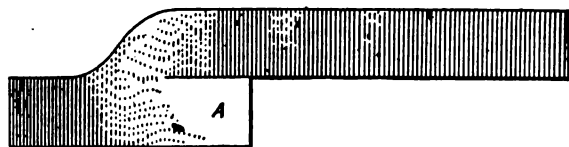


Fig. 1.

and troubles of the connections between battery or magneto and plug-points. What troubles are not found in one or the other of the above are not worth classifying—such troubles are exceptions, that's all!

Naturally, spark plug troubles should be looked to first for they may not be the most numerous, but they are fatal at all times while with a poor connection or two, a car may limp along a bit and even run well for a time. To look for ignition troubles, start at the plugs and make sure that the trouble is not with them. It is necessary, when making a thorough inspection, to remove each plug, place it in position to be connected properly outside of the cylinder and then run the ignition device and note whether the plug actually delivers the goods in the shape of an adequate spark—a "good 'fat' spark" if you wish!

Fig. 1, shows a very neat method of testing out not only all the plugs, but the connections and the timer as well. The connections may be tested thoroughly

in a few minutes by means of a common telephone receiver. This method of testing was illustrated and described in *The Automobile Dealer and Repairer* some time ago.

A very good way to support the spark plugs in working position, and at the same time test out the connections and the timer, is to cut out a bit of sheet brass to the shape shown in Fig. 1, then fold or roll the brass as shown by Fig. 2. The diameter at B is just sufficient that the spark plug C, may be slipped inside the rolled-up brass and tight enough so that the plug will not fall out even when the engine is cranked with the plug in the jig as shown. The outside of A must be made just large enough to fit inside the spark-plug hole in the cylinder. The brass must be springy

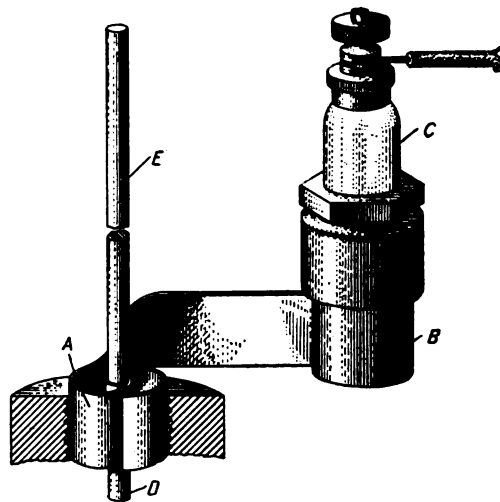


Fig. 2.

enough to allow it to hold itself firmly in place in the plug hole.

Inside of the jig, which is also coiled closely to receive it, is placed the smooth round steel pin, E, D, with end D, resting fairly upon the end of the piston. When the engine is cranked, the rod moves up and down in unison with the piston and the plug being connected the same as when running, it can readily be seen when the spark comes, how "fat" it is, and by means of the rod, it can be seen at what exact portion of the stroke the spark takes place.

Make similar jigs and connect up all the cylinders of the engine, then get some one to turn the crank slowly. It will turn very easily with the vents caused by the plug openings. Then make marks on the rods at the point on each which represents the beginning and end of the piston stroke. Then revolve the engine shaft again and find the points where the spark occurs in each cylinder. Then, if the several sparks are delivered at the same distance in advance of the dead center of the several cranks, then it may be safely regarded that the sparks occur as they should and are under control of the timer and the spark advance lever. But when one or more of the sparks is found too far from, or too near to the end of the stroke in comparison with the other sparks, then attention should be given to the timer.

It will be noted by inspection of Fig. 3, that the rods D, project varying distances above the top line of the cylinders. This is because the pistons are in different parts of their several strokes at any given instant. By turning the crank at a speed approximating the speed of the engine when the car is running, the entire action of the several plugs and the timer may be observed

exactly as it takes place inside the cylinders during actual work. If there be any irregularity caused by poor connections, this will also become apparent in the behavior of the spark from the defective connections.

To use the receiver test, just connect the instrument with the circuit, either in series or in parallel, though the former is preferable, have either the spark battery

at a plug and determine if it be in perfect condition. Dig off all the carbon and burned-on grease and see whether or not there are cracks in the porcelain. Sometimes a plug will refuse to deliver a good spark, no matter how it be connected up and in such cases one is pretty apt to find one or more minute cracks through the porcelain and these cracks have become filled with carbon until they are nearly as good con-

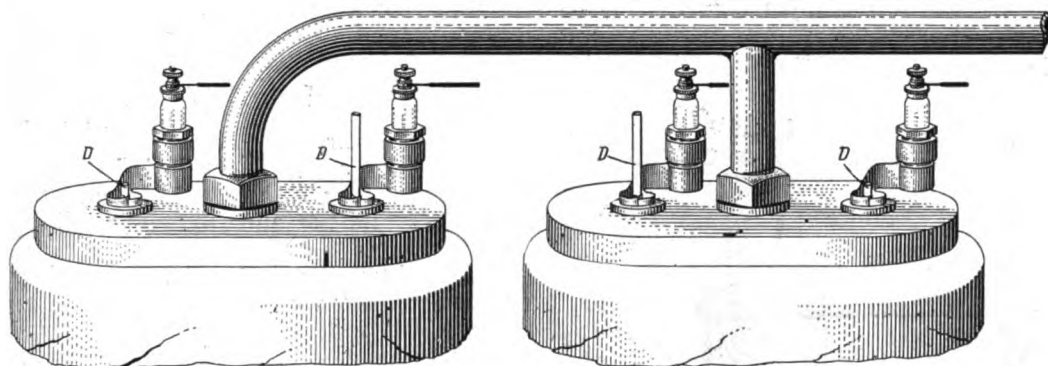


Fig. 3.

or a dry cell in series with the receiver, then with that instrument to the ear, shake each connection, or at least try to wiggle it with the fingers and if there be any looseness of wire or screw, a noise in the receiver will tell the story. If there is nothing loose, there will be no sound in the receiver. But there must be a direct current actually passing in the wires and connections at the instant they are tested. If the telephone be connected in series, the varying resistance of the poor connection, as the wires or the binding screws are moved back and forth, will cause vibrations of the receiver diaphragm which results in sounds being heard in the receiver, sounds more or less loud according to the badness of the connection.

When the 'phone is connected in parallel, the varying resistance of the ignition circuit causes more or less current to be shunted through the receiver. With any two circuits connected in parallel, a disturbance in one of them, whereby its resistance is increased or decreased, will always cause a disturbance of the current passing in the other shunt circuit. When the resistance is normal, both circuits receive a certain current, depending upon the ratio of their resistance, but when the resistance of one is increased, a new balance is struck which permits less current to pass through the circuit whose resistance has been increased and the other circuit becomes comparatively lower in resistance, thereby taking more current than it received before. Any change or fluctuation of current in the telephone will cause sound to be heard, therefore the telephone receiver is able to detect the slightest looseness of any of the binding screws or it will show that something is wrong when two wires are broken inside the insulation, or when they rub together on account of the insulation being bad.

When making up the sparking jigs shown by Fig. 2, if it is not convenient to use thin sheet metal as described above, a bit of spring wire may be used instead, the wire being coiled as shown by Fig. 4. This makes a very easily constructed jig, but the writer prefers the sheet metal form as it is easier to make and less work to insert and attach the spark plug to the cylinder although equal test results may be obtained by the use of either form of jig.

The inspection of the spark plugs should be very thorough—it is not possible to give one or two looks

ductors as a copper wire. When there are several of these cracks, it is nothing unusual to see what should be a fine spark separate into three or four little streaks or sparks of current and sneak across the body of the tube until they find and enter some of the fine carbon-filled cracks noted above. This is one of the worst ignition troubles met with and it will sure fool a man if he is not "high, wide and lively" in his inspection.—The remedy? A new plug by all means. There is no other cure for that trouble!

A friend recently asked the writer why his car habitually shook so badly. He said that at certain speeds, while running on a very smooth road, the car would shake worse than at some other speeds on a rougher road. The trouble this man described is due solely to the vibration of the engines. Three cylinders seem to give a smoother running engine than either two or four cylinders, but six cylinders somehow seems very little better as far as freedom from vibration is concerned, than a three cylinder machine.

Theoretically, a four cylinder engine should run with much less vibration than a three cylinder machine, but somehow it don't seem to deliver the goods. The reason probably is that in a multi-cylinder engine where the attempt is made to nullify the gyroscopic action of unbalanced revolving masses by opposing them with other and diametrically opposite moving masses, the designer loses sight of the fact that the two or more opposing masses are not revolving in the same plane. That is: one of the revolving engine masses is two feet or perhaps thirty inches distant on the shaft, from the other revolving mass which it is expected to balance. This means that each mass tends to revolve the engine in a circle eccentric with the shaft and while one end wants to revolve with its center a certain distance from the center of the shaft, the other end of the engine is trying to revolve in a circle, the center of which is on the opposite side of the engine shaft. Thus is caused the shake complained of by the friend in question.

The reciprocating parts of an engine have never yet been perfectly balanced at all speeds. A very close approximate balance has been obtained at a given speed but when any other speed is reached by the engine, the balance is a failure. Here is a great argument for opposed cylinders where the vibrations

are in the same plane and are more easily opposed to each other. And still greater is the argument for a turbine automobile engine in which all reciprocating parts of every description have been eliminated. Then will come the car which does not shake. But then, until the turbine Bubble wagon appears, we must possess our souls in patience and plug away at the reciprocating balance nightmare. Somebody may devise a way to do the balancing business therewith, but certainly that time has not yet come.

The mechanical possibilities are great for the combustion of hydrocarbon in a vessel outside of the

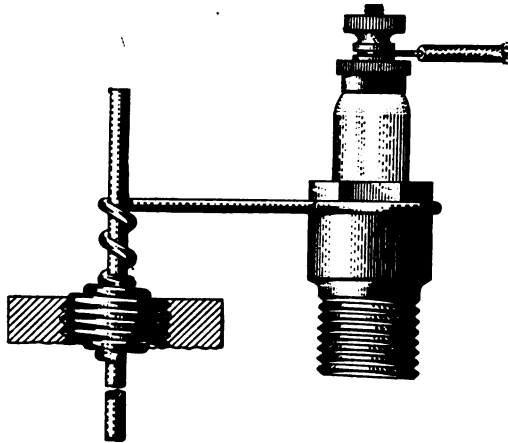


Fig. 4.

engine cylinder, the storage for immediate use of the expanded products of combustion in another vessel or an integral portion of the vessel in which the explosions were produced. In this manner all the advantages of steam could be obtained, together with twice the economy of present methods of internal combustion as regards power development. Who is the man who gets this reduced to practice? There are many fortunes in it for the man who "gets there" first and—holds his patent claims!

An Ominous Noise.

Among the many noises that are likely to develop in an automobile are those coming from deficient bearings. A crunching noise in a bearing should receive immediate attention, the bearing being taken apart in order to discover the cause. It may be found due merely to the presence of some grit, though that is bad enough. In this case a thorough cleansing of the bearing and lubrication will cure the trouble. If one of the balls is found to be broken, all the bits must be removed and a new ball inserted. But unless the new ball is a shade too large, it will also certainly cause trouble. When the bearing is apart the cones and cups should be carefully examined for scores and cracks, and if these are found, the parts affected should be renewed at the earliest opportunity. In some cases, where the damage to the bearing parts is serious, it is best to remove the balls and let the bearings run on the plain surfaces as far as the nearest point available for repairs. If a spindle has been cut into so as to weaken it materially, the load should be lightened as much as possible, or the run discontinued entirely, pending repairs.

The Great Western 1911 Line.

The Great Western Automobile Company of Peru, Indiana has announced its 1911 line, which includes a varied assortment of body types designed to please the

buying public whatever the taste of the prospective customer may be.

The line includes a five-passenger touring car, a combination demi-tonneau, a roadster, a type of body which the Great Western Automobile Company has defined as a semi-torpedo and a full-fledged torpedo with a hooded dash and high sides, and a brand new type of torpedo roadster.

The same pleasing lines as were shown in the 1910 touring car have been followed out in the 1911 model, but we observe some minor refinements in the small details of the completed car. The deep coach blue body is set off to greater advantage by the cream wheels with which the chassis is now equipped. The foot-boards are bound in brass.

The regular equipment includes magneto, large gas lamps, generator, oil lamps, horn and large tool box fitted with lock and key and strap robe rail and a full set of tools.

A demi-tonneau designed to carry four passengers is one of the new body types shown. It is particularly roomy and will actually carry five people, although it was the intention of the designer to make it a four-passenger car. There is plenty of leg room in the tonneau to ride comfortably without feeling cramped and to store some luggage at the same time. This tonneau is detachable and is interchangeable with a single rumble seat which is furnished without additional cost and which converts the demi-tonneau into a roadster.

This combination body is fitted with a hooded dash with just enough protection along the side of the driver's foot-board to keep the dust and wind away from the feet of those riding in the front seats. This demi-tonneau combination equipment is painted the same as the touring car and has already met with the approval of Great Western dealers.

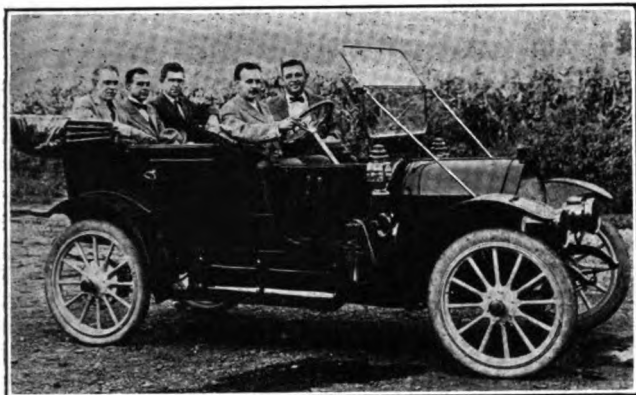
The touring car and this combination demi-tonneau and roadster and the torpedo roadster, sell for \$1,600, the same as a year ago. The chord of popular fancy seems to have been struck with the design of the fore-door semi-torpedo, which lists at \$1,650. This semi-torpedo hasn't the extreme lines of the full torpedo, but gives the driver the additional protection of the front doors and is a very stylish body in every particular. The body trimmings are in Circassian walnut and the body itself, as well as the frame, axles, hood and radiator are painted a royal purple. The radiator is aluminized, making a very pleasing effect from whatever angle one observes this model. The sides of the tonneau are high and the upholstery is very luxurious. There is a compartment large enough for small tools or memoranda between the driver's seat and the front passenger's seat which can be very easily gotten at. The doors are fitted with hook locks to avoid all possibility of their opening while the car is going over rough roads.

A new full torpedo is added to the several body types in order to meet the requirements of those living in the center of industry. This full torpedo which is painted a beautiful brown, sells for \$1,750. The car has very pleasing lines. The dash is of the deep shrouded hood type with high sides to the body running in a straight line to the upholstery at the back of the body. The four doors are equipped with invisible hardware which materially adds to the pleasing general effect.

The control set is located on the inside of the body and as there are no brake rods or other paraphernalia on the outside of these chassis, this type is particularly free from any outside encumbrances. This model is intended for four passengers, although the design is characteristic of all Great Western models in the fact that it is particu-

larly roomy. The full torpedo is equipped with 35 x 4-inch tires in addition to the regular equipment.

The chassis on which these different body types are mounted are all identically the same. By devoting their entire attention to one running gear and power plant the



Great Western Five Passenger Touring Car.

factory is able to produce a much more refined chassis than would otherwise be possible.

An examination of the material and construction of these cars cannot but delight the eye of the engineer or mechanic. That they are built to endure and that without the repair of so many inferior cars is not only plainly apparent, but it has been and is being constantly demonstrated by the most severe tests.

USES KEROSENE FOR FUEL.

With Perfect Combustion, No Smell and Very Little Cost.

Over on Borden Avenue, Brooklyn, may be seen almost any day, attached to two or four cycle engines in the same manner as a muffler, a smooth cylinder, some six inches in diameter and possibly 14 inches in length. With the aid of this device it is not only claimed but guaranteed that any gasoline engine of standard make may be run with kerosene, with perfect combustion, no greater consumption of fuel and no decrease of horsepower. In fact, the engine seems to run with rather more vigor or power on kerosene with this device attached than if run with gasoline. Here are some other claims made for it, and mind, they are not mere assertions with nothing to back them up, but the manufacturers gladly install the device with the understanding that if they are not made good, there is to be no sale or payment:

That it will furnish the engine with a perfect mixture under all conditions of speed or load, and with a greater range of speed control than with any other system.

That it is more economical in every way than present methods, using every atom of fuel.

That it will absolutely prevent a smoky exhaust, due to imperfect combustion, thus insuring clean cylinders.

That on account of the simplicity of its construction it will outlast any engine.

That atmospheric temperature changes do not affect it, and that by its use the varying specific gravity of gasoline sold to-day and the attendant troubles are entirely obviated.

The principle used has been subjected to six years of continued effort, engineering skill, and experimental tests of all kinds, in connection with stationary, marine

and automobile engines, until it has attained complete commercial success.

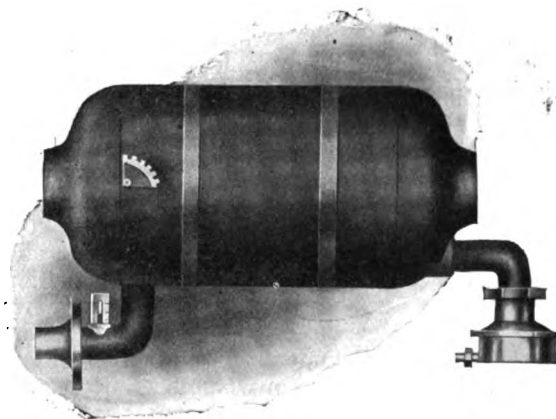
The illustration will give an accurate idea as to its general construction. There is absolutely no moving part, and once installed, it becomes an integral part of the engine, and needs absolutely no attention.

The principle of its operation is as follows: The fuel is first atomized and then drawn by the suction of the engine through passages heated by the exhaust, thus making the device automatic, and suiting the requirements of the engine under all conditions of speed or load. The exhaust is practically clean, odorless and colorless, which signifies perfect combustion, a minimum consumption of fuel, and a maximum of efficiency.

Engineering experiments and tests made under variable conditions have demonstrated the fact that this device consumes from 10 per cent. to 15 per cent. less kerosene than gasoline to produce the same horsepower, and the saving can easily be estimated.

The Gas Producer has been in practical and continued use in the shops of the manufacturers for two years, running machinery, driving an electrical generator with a battery of test lamps, driving a 60-foot boat, and driving a 60 h.p. automobile engine. The result of these tests gives the manufacturers so much confidence in it that they are offering to install it without cost on the Fifth avenue automobile stages taking payment on the amount saved in the cost of fuel.

But there are still other reasons why this gas producer is desirable other than its saving in expense which is said to be enough on the operation of a 20 h.p. engine in 60 days to pay for it. It not only gives more power and a cleaner exhaust, and will lower the



The Universal Hydrocarbon Gas Producer.

insurance premium, there being no restrictions against the use of kerosene by the fire underwriters, but kerosene has the following other advantages over gasoline:

It is non explosive and non inflammable. It cannot be ignited by open flame or spark until after its conversion into a gas. It is non volatile, and evaporates very slowly, hence more economical to keep. It is not subject to atmospheric temperature and altitude changes. It is uniformly cheaper than gasoline and regular in gravity. It is obtainable anywhere on the face of the globe at moderate price.

The Gas Producer is patented, carefully tested before leaving the factory, and is sold under a positive guarantee for one year. The full name of the attachment is the Universal Hydrocarbon Gas Producer.

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, JULY, 1911.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

KEROSENE FOR FUEL.

In good time something will be found as a substitute for gasoline as a fuel for the automobile engine. It has always been the case that when a great and universal need has manifested itself some one has been able to supply it. The undevout and worldly ascribe this to the genius of man, but the spiritual minded attribute it to the wisdom and goodness of the Creator. But be this as it may, as soon as the need becomes sufficiently imperative, the supply is soon forthcoming.

When it became necessary to get out of sight of land in navigating the seas, someone—nobody knows who—discovered the mariner's compass or the magnetic needle. When wood for fuel began to get scarce, it was learned that the combined effects of pressure, heat and chemical action upon vegetable matter produced in coal a superior substitute. When the sperm whale began to grow scarce after furnishing oil for lighting purposes for several centuries, mother earth again came to the rescue, and gave us petroleum, something far better and of wider use. If that should give out, or Mr. Rockefeller were to impulsively put the price beyond human means, why, quite likely something better than this would appear, so he is hereby warned to not to be too greedy. When quick communication became imperative, behold the locomotive, the automobile, the telegraph, and the telephone.

Now the automobile is using up the supply of gasoline faster than it can be produced. It is not like a scarcity of rubber. When the supply of this gets low, human industry can apply itself to the growing of more rubber just as it now produces wheat or cotton, but man cannot make gasoline; he can only barrel it as the earth gives it up, and when the earth ceases to longer give, then something else must be provided. It has been demonstrated that alcohol is not a good substitute, even though it may be produced at a very low cost.

It begins to look as if kerosene would soon take the

place of gasoline as fuel for internal combustion engines, and fortunately the supply of this petroleum product seems to be sufficient to provide the need for a long time to come and at a cost within the reach of all. Indeed, it is stated that the Standard Oil Company has so many million—or hundred million, or thousand million—barrels stored already that it hardly knows what to do with it.

Recently the writer saw a four cycle and a two cycle internal combustion motor being run with kerosene as a fuel, and he must confess with apparently far more satisfactory results than with gasoline. There was perfect combustion, a silk handkerchief having scarcely been soiled by placing it over the exhaust, with no perceptible odor, and it clearly ran the motor with a greater strength than when it was fed with gasoline. Of course, we all know that kerosene is safer as well as cheaper. The only possible objection to its use is the necessity of using gasoline to start the engine, but this is attended with no trouble, loss of time or other inconvenience.

Some details of this invention are given on another page of this issue. We are unable to see any reason why it should not displace gasoline for fuel on automobiles, sooner or later, and to the decided advantage of the user under any condition. As there is no stock for sale in this enterprise, and the company which has it in hand offers to take for the purchase price of the device the savings over the use of gasoline for a not very long period, we can afford to thus state the facts as they appear without being open to the charge of assisting a stock exploitation.

A CURB FOR THE RECKLESS.

Reckless driving on roads and streets must be stopped. The day of the joy rider soon will be no more. A long suffering public has stood for the reckless driver much longer than it has stood for any like evil, and the worm has turned. The officials of the law have at least realized that it is often difficult and more often impossible to identify the car or driver responsible for running down pedestrians, other cars and horse drawn vehicles. The meting out of fines seems to do no good so far as preventing the same or other offenders from violating the ordinances almost daily, and a number of officials in different sections of the country with whom I have discussed the problem have told me it was their opinion that almost every State in the Union will enact, within the next few years, stringent measures calculated to prevent a car being geared so it could travel faster than the legal speed limit.

This is the only remedy that will prove a real preventive against speeding, for the inclination and desire to speed seem to be inborn in the average violator of the ordinances regulating the gait of motor cars. To my mind, the different clubs and motor organizations which have opposed measures introduced in the Legislature or Council to curb the evil of speeding did not act in the best interests of the sport. Instead of spending money to send a representative before the different bodies of lawmakers to fight the proposed laws, they should have sent a good, level-headed representative to reason with the committees and lawmakers. Much more could have been accomplished by meeting the law half way.

The big increase in the number of automobiles and the great number of accidents occurring almost daily, cannot help but call for a preventive from the lawmakers. There would be no murders by shooting if it were impossible to obtain firearms, and no speeding if a car could not travel faster than the speed limit, is the theory of an Iowa Judge that I met while touring in that State last week. Many of our wealthy citizens have been handled in a manner to cause them to respect the law in France and Italy, after having been responsible for an accident in those countries. In Europe the peasants are often more to be feared than the officials. What we most need in America is a national registration and uniform speed law.—Barney Oldfield, in the *N. Y. Herald*.

Mr. Oldfield is no "prentice hand" at the business, and his opinions therefore deserve attention. And if there were but one legal rate of speed limit, applicable

at all times and in all places and cases, his remedy of gearing the car so that it could not travel faster would be efficient and easy.

But suppose this gearing be fixed so that the car could travel a mile in three minutes, which would be slow speed for the country; how could protection be secured within the limits of cities or towns where this rate of speed would be altogether too fast? In such cases the reckless and inconsiderate would still drive so fast as to endanger life in thickly settled communities, even though protection might be afforded where it is least needed.

A thorough consideration of the matter leads to the conclusion that there is no preventive of reckless driving save by fixing the speed at whatever is necessary to protect the public, having proper regard for the traffic and the use of the way, *mutatis mutandis*, and let the court or trial justice be the judge after hearing the evidence. Then, if convicted, in the words of the lamented W. S. Gilbert of Mikado fame, "let the punishment fit the crime." And to fit such a crime, the sentence should be sufficient to not only prevent and restrain but to practically preclude the offense.

Already among self-respecting persons reckless driving is considered low and vulgar. That feeling will soon be intensified and widened. When it becomes a well-defined public sentiment, it will do much to lessen the evil.

If a man has a speedy car, and there is an occasion for fast driving where the public is not endangered, then it should not only be his privilege to drive fast, but to fix a limit of speed would be unjust. In the case of a physician being called to see a patient where life or death hang in the balance, or some other instance of similar import, there is ample warrant for making good time.

ECSTATIC ADVERTISING.

The best automobiles made in the world to-day are those selling from \$725 to \$1,200. They are the product of higher salaried engineers, of better factory methods; they are made of better steel and more scientifically heat treated and more skillfully wrought than any cars selling at higher prices.—From a 49-page automobile advertisement.

It looks something as if the zeal and ecstasy of the foregoing able advertisement writer had got the better of his judgment, or that his 49-page verbosity had overthrown his reason.

The word "best" is a superlative; it means there is nothing as good. Yet evidently not being quite satisfied with the first sentence in the paragraph quoted, it is amplified in the second, although one would imagine he would want to qualify it a bit and state, for instance: "We do not exactly mean that our cars selling for from \$750 to \$1200 are the best in the world at any price, but that they are among the best." Or, with somewhat less fervor—since the writer of this astounding advertisement does not know the salaries of all the good automobile engineers, or how scientifically other manufacturers treat and heat their steel, or how skillfully it is wrought—he might have said: "We believe our cars selling for \$750 to \$1200 are the product of as high salaried engineers, of as good factory methods, and are made of as good steel as any other cars, no matter what the price."

It gives the reasoning faculties a jolt they cannot withstand to feel that cars selling for even the larger sum named are better than some that sell for from \$4000 to \$6000, and leads one to indulge in the hope

that the aforesaid firm can make better cars than advertisements.

Or was the statement of the esteemed 49-page advertisement writer merely intended for a bit of airy persiflage or just a subtle joke?

MATERIAL AND LABOR.

No one need imagine for an instant that the reduction in price of Para rubber to about one-half what it was a year ago will cause anything like one-half reduction in the price of tires.

The cost of the raw material in a pneumatic tire is a mere bagatelle of the cost of the finished product. The chief cost of rubber tires is the labor that goes into their manufacture.

This being the case, a cheap tire, where the rubber is of inferior quality, is about the most short-sighted purchase one can make. The best is the cheapest in the end in the case of tires as it is in everything else where the chief cost is due to the labor of fabrication.

Cheap material in automobiles is likewise the dearest in the end. The man who is about to purchase a car should look carefully into the raw material with which it is composed. It is true that machinery, and in many cases automatic machinery at that, has greatly reduced the cost of production over what it was ten, or even five years ago, but despite this the chief cost of an automobile to-day is the labor employed in its construction and marketing.

Some years ago a bicycle manufacturer was forced to go into bankruptcy after selling bicycles for \$150 each. After he had got matters settled with his creditors he again went into the business and sold wheels for \$15 each. He told the writer that in his opinion the wheels he then marketed for the small price were about as good as those which he was unable to sell at a profit for the larger sum. He added that the difference in cost of production was mostly in the use of machinery, the \$150 wheels having been made by hand.

The term "hand made" has lost its force and it is often a confession of needless cost.

NEEDLESS PREJUDICE.

It is never a pleasant duty, and sometimes it is not a wise one to interfere with others even though they transgress the law, provided they do not affect us in any way. The homely old adage, "Mind your own business," holds good for practical purposes.

But when one is a witness of reckless driving or of other unlawful acts in the public highway, it is his plain duty to jot down the number of the car and report it to the officers of the law at the first opportunity. To interfere is simply to "Mind your own business." Nothing would do more to overcome the existing prejudice against the automobile or to make the highways safe for all.

The Massachusetts Highway Commission has taken up this matter seriously and makes the following suggestion: "The whole matter is in the hands of the motorists. If a person saw another man setting fire to a building, committing robbery or some other crime, he would notify the police. Yet reckless driving is much more serious, for it endangers lives. Some people think they might be classed as informers if they should report instances to the highway commission. It would be nothing of the sort. When men meet at clubs they retail these instances which have made them angry and say reports should be made, but that ends it."

With co-operation on the part of decent automobilists—and most of them are decent—the evils of lawless driving would soon be eliminated. But as long as lawlessness

is tolerated by those who in many instances are able to help put a stop to it, the roads will continue unsafe and unwarranted prejudice will exist against the automobile.

TOO MUCH OR TOO LITTLE.

Many cars quickly get to running badly from two widely different causes, but the effects are equally disastrous.

One man purchases an automobile, and bearing in mind the injunction to let it alone—meaning of course, not to try little experiments without necessity or be continually tampering with its mechanism—he will totally neglect the little things that are absolutely essential to keep it in good condition. He never thinks of over-looking it carefully after or before a run to see if the nuts are all right and the bearings neither too tight nor too loose. Nor does he seem to be aware that some parts of the mechanism require little oil and some parts much, and some need one kind of oil and some another. The result is that his car soon gets out of order and must go to the repair shop for a general overhauling and possibly for the replacement of parts that have not indeed been worn out from long service, but from neglect.

Then there is the other car destroyer who does too much oiling and too much tinkering. He is liable to give parts that scarcely move as much oil as the engine bearings or the fan bearings, and as a result the car soon becomes gummed with oil and grease and is a candidate for the repairman.

The car should be frequently overlooked, but if kept properly oiled and used intelligently, it does not need frequent overhauling.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

Accidents at grade railway crossings continue with alarming frequency. This month, judging from reports, they exceed in number any other kind of accident even if they do not outnumber all others.

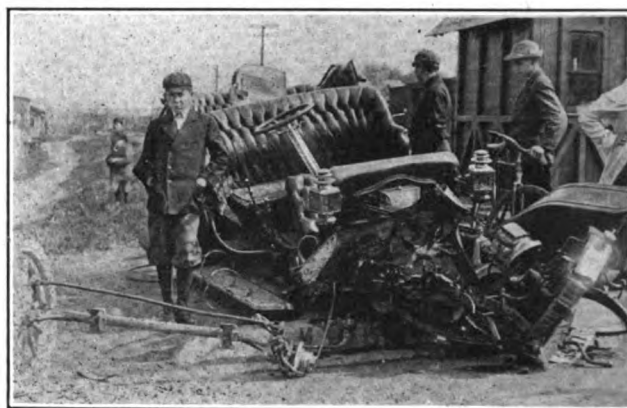
We have advised again and again, that the only safe way is to not merely slow down on coming to a grade crossing, but to come to a dead stop and look and listen. Some trouble this, we will admit, but it is rather better than to lose one's life or to take the life of another. In some instances indeed, drivers have not stopped for such a detail as the raising of the gates, but have thrown them to one side as if they were cardboard and gone on without identification. Such is the recklessness of speed mania.

It should not be forgotten that the courts have held that the driver of a horse-drawn vehicle approaching a railway crossing must look and listen in a reasonable way, so as, if possible, to secure his safety. The proper application of this rule to the driver of an automobile is simple and far less difficult than for the driver of a horse. He can approach nearer the track, as he has not to consider the danger of fright to a horse. If his machine is a good one it can be controlled easily and perfectly, and there is no danger from it if he stops to look and listen within 6 feet of the track. With proper care on the part of the driver there is no danger in crossing a railroad with an automobile upon an ordinary highway in a country town or elsewhere.

At Railway Crossings.

It is an undoubted fact that to-day more accidents to automobiles occur at railway crossings than from any other single cause. The fact is, drivers dislike the

trouble of stopping. They are so overpowered with the speed mania that they recklessly run their cars over the tracks without stopping to look or to listen. The accidents might be avoided easily if the car were stopped or slowed down long enough for the driver to look along the track both ways. Many accidents take place where the driver of the car is absolutely blame-



less, but this is not the case with most accidents at grade crossings.

A reader sends us the accompanying illustration, showing how a car was reduced to junk near Shelby, Ohio, by the lack of observance of the simple rule above stated. It appears there is no gateman at this crossing after 6 o'clock P. M., when one is most needed. The accident caused the death of four men.

Killed by a Bursted Tire.—Two young men were returning from Trinity College in Hartford, Conn., and were going at the rate of fifty miles an hour when a rear tire burst. The car skidded and plowed through a rail fence, uprooting a 20-foot tree in an open lot. One of the young men was thrown out and uninjured, but the other was killed. The dead man was studying for the ministry.

The Old Story of Skidding.—Near Olean, N. Y., a car with six passengers was going down hill and at a turn at the foot it skidded and overturned. One was killed, another was dying at last accounts, and the others were badly cut and bruised.

The Deadly Crossing.—Five persons were riding on a strange road near Herkimer, N. Y., and going at a moderate speed only. They had a covered wooden bridge to cross, and the sound of the automobile running over the planks of the bridge floor drowned the noise of the signal bell of an approaching train. Just as the car left the bridge the danger was seen by the occupants, and the driver attempted to turn the car to the side of the road. But it was too late and a collision occurred, killing three of the occupants and badly injuring the other two. The automobile was a complete wreck.

Tire Inflation Dangers.—Unless there be some weakness in the tire or carelessness in allowing the inflation to get too high, there is of course not the slightest danger in pumping up tires. But either of these contingencies is liable to cause a serious accident, and when there is a possibility that one or the other may exist, or for that matter, in any event, it is well not to have the head or face unnecessarily near when pumping. At Easton, Pa., two boys were pumping a tire, one doing the pump work and the other holding the hose, when without warning the tire exploded with terrific force. Both lads were rendered unconscious, one having a compound fracture of the right arm and other injuries, while the other lost several teeth

and was cut and bruised. The report is that the tire that exploded was to all appearance as sound as any other.

A Fatal Patch of Sand.—In Redlands, Cal., a man was driving about 40 miles an hour when he lost control of his machine in trying to pass another car. He swung his car to the side of the road and the wheels struck a patch of sand. The car was overturned and the driver caught beneath, crushing his skull and killing him instantly.

Result of a Dirty Wind Shield.—Near Rolfe, Iowa, a child was killed and the other passengers of a car thrown out when it was overturned by a collision with a wagon ahead. It appears that the wind shield of the car was up and dirty and thus the wagon ahead was not seen until too late to turn out. The man in the wagon was bruised and injured and the vehicle itself badly broken.

Charged with Homicide.—In Brooklyn, N. Y., a chauffeur took a young woman out for a ride before he reported for duty to the car owner. He ran over a lad of 12 years who was playing in the street, and the young woman who was in the car was seen to say something to him—quite likely telling him to increase his speed and get away. This he did, but some one with good eyesight was able to catch the number of the car and he was afterwards arrested on a charge of homicide.

Turned Upside Down.—Near Memphis, Tenn., a big car carrying five persons skidded and turned over killing one person, but the others were not seriously injured. The road at the point of the accident was oiled, and wet from recent rain. The machine was going at a good speed when it struck a sharp curve just east of the rustic bridge. The chauffeur gave his wheel the proper turn to make the curve, but the rear wheels skidded on the ground, and after plunging some 30 feet the machine turned completely upside down. Seeing that the machine was going to turn over, a man, who had been in a similar accident once before, seized the women, and, dragging them down, warned them, to lie close to the bottom. The next moment the big auto crashed over, killing the chauffeur, but allowing the others to escape.

Ran Into the River.—Near Hutsonville, Ill., a car containing three persons ran into the Wabash river. The chauffeur who had not made the trip before became lost and did not know he had arrived at the river until he came down the ferry hill at a rapid speed, and before he could stop the machine it was run into the water and almost submerged. There was no chance for the men to jump and all got a good wetting, but fortunately they were able to reach the shore. Help was procured and with the assistance of a team the machine was pulled onto the bank.

THE CAR AND THE LAW.

The Owner Absolved.—The owner of an automobile lent his machine to another, and on the borrower's invitation accompanied him and others on a ride. The borrower sat in the driver's seat and operated the car; the owner sat in the other front seat. A collision occurred with a street car, by which the conductor sustained injuries, for which he sued the owner of the car and another. It was held that, in the absence of statutory provision, the owner was not liable for the borrower's negligence, although he was in the car at the time, on the theory that an automobile being a dangerous thing, its owner should be held responsible for the manner in which it is used, as the automobile had passed into the possession and control of the borrower for the day. The owner of the car did not have the right or authority to dictate or direct the manner in which it should be operated—Hartley vs. Miller, Michigan Supreme Court.

Automobile Lenders not Liable for Damages.—Two brothers each owned a motor car substantially alike. They kept the cars in the same garage, and by a mutual arrangement each had permission to use the other's car. When either required a chauffeur he would communicate with the garage company. One of the brothers called car of the other brother was delivered, the other car being for a chauffeur, and one was procured, to whom the out of repair. The chauffeur ran into and injured a person, who sued the owner of the car used. It was held that he was not liable. The chauffeur was not in his employ or controlled by him. His only connection with the accident was that he owned the car and permitted his brother to use it. Even if it were to be assumed that the chauffeur was employed and paid by the defendant, that, it was held, would not make him liable, the chauffeur not being at the time of the accident engaged in the defendant's business.—Freibaum vs. Brady, New York Appellate Court.

Contract of Automobile Sale.—In an action for breach of contract by refusal to accept and pay for an automobile under an agreement for its purchase, it appeared that the purchaser signed an agreement to purchase an "F" model for \$3,650. The agreement stated that \$75 was then paid, that \$425 was due on a certain date, and the balance of \$3,150 when the car was ready for delivery. She obtained a receipt bearing these terms, which contained the additional provision that her "G" car was to be accepted as payment of \$1,000 when the "F" car was delivered and paid for in full. Defendant's chief defense was a "countermand" of what she claimed was an offer to purchase not yet accepted. It was held, however, that her contract became complete upon the making and delivery of the agreement and receipt. Her offer to purchase the automobile was accepted by the plaintiff when he received the initial payment and issued his receipt to the defendant. The plaintiff had resold the machine after demand upon the defendant to accept it and obtained \$1,800 for it. In the judgment of the trial court, credit for the amount of \$1,800, plus the \$75 paid as an initial payment was allowed against the purchase price and judgment given for the remainder. On appeal it was held that there should have been some evidence and a finding of fact that the "G" automobile agreed to be received and credited on account of the purchase of the new machine was not delivered to plaintiff for that purpose, before it could properly be found that the cash balance due the plaintiff was as calculated by the court.—Bennett vs. Power, California Court of Appeals.

Garage Manager and Check Endorsements.—In an action on a bank check against the bank, the plaintiffs were co-partners doing business under the trade name of the "Peerless Garage." They sent a bill to a customer for repair work on his automobile. The latter delivered a check for the amount, payable to the "Peerless Garage," to the manager of the garage. He indorsed the check "Peerless Garage" with a rubber stamp and his own name as manager in writing. Underneath that he indorsed it individually and deposited it with the bank to his individual account. The plaintiffs never got any of the proceeds of the check. They had no account with the defendant bank. There was no proof that their manager had any authority to indorse checks. It was held that the bank was liable to the plaintiffs for the amount of the check.—Burststein vs. People's Trust Co., New York Appellate Court.

There are 40,000 automobiles in New York City, representing an investment of about \$80,000,000.



This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge.

Inquirers will please write plainly and give full particulars of their trouble, stated as clearly as possible.

574

Auto Engine for Lighting.

From A. C. Watts, M. D., Alabama.—Please answer if I can successfully use a two cylinder Reo engine for operating my electric plant for my sanitorium. I am at present using a Fairbanks Morse stationary engine very successfully but am contemplating enlarging my plant and can buy an engine such as described very cheaply, it having been in a fire but runs nicely without a load; do you think it would be advisable to operate with this when not more than half the power would be needed to carry the full load of the generator? Would the engine heat badly, as you know an auto gets so much hotter when standing than when running? Would you connect, by belt, direct from the fly wheel of engine to drive of generator?

Please tell me why the bolts that connect the drive shaft to the brake drum and transmission shaft of my Buick model 16, 1909, will not stand or stay tight, they have to be tightened every day or they, the nuts, will drop off. I have had several good mechanics look at it and none can give a plausible answer, I have had lock washers and lock nuts put on but none will hold.

Reply.—A gas engine to be used for electric lighting purposes must be equipped with large heavy fly wheels and a very sensitive governor. We are decidedly of the opinion that there is no automobile or marine engine on the market that would run an electric lighting system at all satisfactorily. The engine would not heat up badly providing there was a sufficient water supply. An automobile engine heats up when running idle, usually more on account of late spark than anything else. Direct connection, when properly made, is much preferable to belt drive.

The drive shaft is undoubtedly not in line with the transmission shaft. If you had means to hold the two shafts rigidly connected you would probably break either one or the other of them. Your only remedy is to have the two shafts properly "lined up."

575

Restoring Dry Cells.

From William R. Lewis, Illinois.—Perhaps some of the readers or your electrical correspondent can tell me what acid they use to restore dry cells. I have heard that by boring two small holes on opposite sides and putting in one ounce of acid and then one ounce of water, then closing up the holes with sealing wax, they can be made nearly as good as new. I am unable to learn what is the best acid for this purpose.

Reply.—Dry cells contain besides the zinc and carbon elements, sal ammoniac, water and some depolarizer, such as black oxide of manganese. If anything is added to bring them up temporarily water will usually do as much as anything, although you could not injure them by adding sal ammoniac. We are afraid you will have your trouble for your pains trying to make exhausted dry cells "nearly as good as new."

576

A Waste of Oil.

From W. Brown, New Jersey.—What is the cause and cure of oil being thrown out through the breathing pipe in model N Ford cars? I have put in an At-water-Kent Unisparker on model N Ford and it works great. There is no more missing and it takes all the hills on high gear easily.

Reply.—Probably leaking piston rings or too much oil in the crank-case or both. The oil splashes up to the opening within the crank-case and the pressure leaking past the piston rings drives it out. If the piston rings are not tight your compression should not be good in one or more cylinders. The remedy is obvious.

577

Ignition Trouble.

From Carl Swigart, Iowa.—I drive a No. 2 Peerless car and practically have no trouble with the car proper, but do have trouble with the ignition. It has an Eisman magneto and a Fulmer (?) battery both supposed to be A1, and are when they are right. My batteries run down in a few days. I have used two in the last month.

Reply.—The vibrator adjusting screws on the coils may be screwed down too tightly. The further down they are adjusted the more current it takes, and conversely the farther apart the contacts are the less current. The reason for this is that every time the primary or low tension circuit is completed at the timer the armature of the vibrator is attracted by the magnetized soft iron core and this breaks the circuit. As soon as the circuit is thus broken the core demagnetizes and the spring carries the vibrator back against the adjusting screw, again completing the circuit. The further apart these contacts the less the vibrations.

578

A Severe Pounding.

From J. D. Johnston, Iowa.—Under your trouble department I have taken great interest and was specially interested in the advice your editor gave in the last issue as to the proper method in braking a car down hill. I had just commenced this plan with excellent results until to-day going down a very large hill I placed the speed lever in intermediate, turned off the ignition and retarded the spark and throttle, but the hill being quite steep and the foot brake not yet holding the car under control I brought into operation the emergency brake which is connected to and releases the clutch, and everything worked lovely till nearing the foot of the hill when the spark and throttle levers were advanced, the ignition turned on and the clutch let in, which caused a very severe rattling and pounding noise under the car as if the gears might be stripped, or some damage of this kind done to the car. Nothing of this kind was done but what made this unusual and severe pounding noise? Kindly answer in your next issue.

Reply.—The severe pounding was due to too early ignition in all probability. The spark lever should not have been advanced until after the clutch had been let in. It would have been better to have let in the clutch, then turned on the ignition and gradually advanced the spark.

579

Carburetor Trouble.

From A. W. Mueller, Iowa.—I have a four cylinder 1910, Flanders, 20 h.p. car, and I am having some trouble with the carburetor. At times it will run along for half a day and develop all kinds of power and

then it will get a streak and not go at all, unless I keep priming the carburetor. Now, I would like to know what you know about this particular type of machine and its carburetor. What make of a carburetor would you recommend for this particular machine in place of the one put out by the E. M. F. Company? The water in the radiator also heats very easily. Do you think that this is caused by feeding too much gasoline or running the engine too fast? The Flanders twenty motors are all very high speed.

Reply.—The Flanders carburetor is made at their factory and we have had a rather good opinion of it. Are you sure the water is circulating properly in the radiator, and that it is not clogged with lime deposits or something of that sort? If the water boils a minute or two after stopping the car, it is usually an indication that the radiator is a little too small for the engine. We do not think that the heating is caused by running the engine too fast in this case, but rather there is some fault in the circulation system.

Of carburetors there is no end and it would be impossible for us to recommend any particular one for your car without doing some other one perhaps as good an injustice. If we were in your place, we should hesitate about changing your carburetor until you had consulted the factory, or submitted your car to a thorough examination by some experienced repairman.

580 Wants to Use a Unit Sparking Device.

From C. M. A. Sorensen, Pennsylvania.—In shipping my Franklin touring car up to this place some one stole the spark coil and other accessories of the machine. Can you through your paper or otherwise tell me how to install what you in your April issue call single or unit sparking device with a non-vibrating coil as a battery ignition outfit? Or is there any way that I can use a single spark coil for a 4-cylinder motor?

Reply.—The Atwater-Kent Unisparker System, which is in all probability the device referred to, employs a non-vibrating coil, a secondary distributor and a direct current low tension vibrating magneto. This system of ignition does not employ batteries of any sort so far as we are able to learn, but we know of no reason why a battery could not be used in lieu of the magneto, provided a master vibrator, such as is furnished with the original Atwater-Kent System, is included in the low tension circuit. If a non-vibrating coil, a separate vibrator and a battery are employed, there can be nothing gained over a vibrating coil, the results in both cases being absolutely identical. The sole object of the Unisparker System, as we understand it, is to make a single coil answer for multi-cylinder engine construction, the necessary vibrator being in the magneto. To do this necessitates some device for distributing the secondary current. There are several secondary distributors in the market, and at least one other similar magneto, the Splitdorf.

Single coils may be used with high tension distributors, but they will need to be either of the vibrating type, or use separate master vibrators and condensers if non-vibrating coils are used. Non-vibrating coils give a small spark on closing the primary circuit and a large one on breaking it. Vibrating coils, and also non-vibrating when using separate master vibrators, give a succession of sparks, more if the vibrator tension screw is set down close and less if contact parts are apart all they will stand. The manufacturers of distributors always furnish wiring diagrams, or the wiring connections are marked on the devices. The

object of a distributor is to make one coil do for a multi-cylinder engine. One wire from the distributor primary leads to the coil primary, the other primary binding post on the coil being connected with switch, then to battery and to the ground on the engine. The coil secondary binding post is connected by heavy cable with the secondary binding post of the distributor, while the leads from the distributor to each spark plug are usually arranged in a circle, leading out of or near the top or cover. Very few manufacturers of automobiles use distributors, and there are very few manufacturers of automobiles that have not experimented with them.

581

New Form of Muffler.

From C. A. Larson, Illinois.—Will you kindly answer a problem which has caused an argument between myself and a friend in regard to a muffler being constructed in a cylinder form and having a series of fans placed inside so when the exhaust pressure strikes them, they will revolve, thereby dissolving the noise? This may be true, but he claims when the fans get going they will produce a suction and aid the discharge, but I claim it will not, because it must depend upon the force of the discharge to produce any momentum, therefore, it will never revolve fast enough to create a vacuum.

Reply.—A cylindrical muffler with revolving fans in itself presents some very difficult mechanical problems, such as securing materials sufficiently refractory and providing proper lubrication, owing to the great heat to the exhaust gases. Were such a construction remotely possible it would take power to revolve the fans. This power would cause an appreciable amount of back pressure in the exhaust piping and manifold. Racing cars usually have four chutes exhausting directly into the atmosphere to get increased power. You are safe to wager any amount that there is never any partial vacuum anywhere in the exhaust piping or muffler of any four cylinder automobile gas engine, when running even at low speed.

582

Misses and Backfires.

From George Lane Woodruff, New York.—As a subscriber to your paper, I write you to see if you can give me any suggestion which will solve the puzzle I have been working over for the last month or so. I have a 1910 Chalmers "30" which I bought new last year, and which gave me perfect satisfaction last season, but as a matter of precaution I had it completely overhauled this winter, and lately it has begun to miss.

After I have been on the road for a while and the engine has warmed up, it will begin to miss sometimes once and sometimes two or three times and then it will go along nicely for some time, sometimes for the rest of the drive. Sometimes it is just a plain miss, and sometimes it fires back either through the muffler or the carburetor. It occurs mostly when I give it a little more gas, for instance, when I have been running at 15 miles and start to speed up, or when I give it more gas for a grade, or if I drop into second. It does not miss always under the above conditions, and will often take a hill on high at good speed and pulling like a race horse, with never a miss.

I take care of the machine myself, and like to puzzle out its ailments, and I have done the following to try and discover my trouble—put in new plugs on the magneto circuit, thoroughly cleaned and adjusted the magneto, cleaned and ground the valves, and made sure that none are sticking in the guides, inspected

and cleaned the carburetor. The latter is adjusted properly and the compression is good and even for each cylinder and the engine runs nicely free.

The engine shows no lack of power or any other symptom previous to a miss, nor does the miss occur on a rough bit of road or after a jounce, which would indicate a loose or broken wire. The wiring by the way, was put in new this year.

When cleaning the cylinders, I have noticed that they are lubricated very freely, could it be that oil is at times thrown on a spark plug? I think it hardly likely, as the plugs are in the cylinder over the exhaust valves.

Reply.—Your trouble may be due to the carburetor not having sufficient vacuum when running at low speed to completely vaporize the fuel, with the result that the mixture is too rich when first opening up the throttle. It might be caused by the float sticking. Muffler explosions are usually caused by miss firing, due to too rich or too poor mixture. Back-firing through the carburetor is usually traceable to sticking of an inlet valve stem or insufficient gasoline, such as a sticking float might cause. If the trouble is caused by dirty plugs try reducing the quantity of oil or use an oil of slightly thicker consistency. If the plugs were directly over the inlet valves instead of over the exhaust valves we think the results might be better.

583 Overheating and Magneto Timing.

From Reader, Indiana.—Would you kindly inform me what are the causes for the overheating of the water? I have examined the circulation and have regulated the carburetor about O. K.

I would also be very much obliged if you would explain the timing of the magneto.

Reply.—As to the water overheating in your car, if the circulation is regular and the carburetor supplies the proper mixture, the cause is due to some one of the following reasons: Late timing of the spark; loose fan belt; cylinders carbonized; improper timing of the valves; weak ignition; poor compression in the case of an excess of gas to obtain the power. The magneto should be timed in advance of the battery timing, although no set advance is known, as some cars can stand more advance than others. When the current is switched from the battery to the magneto, there should be a noticeable increase of speed in the motor, except where the magneto breaker is used as a timer. In such a case, the motor will run at the same speed. To time the motor, find the order the cylinders fire by watching the closing of the exhaust valves (as Nos. 1-2-4-3 or Nos. 1-3-4-2 as the case may be in a four cylinder motor). Turn the motor over so that No. 1 cylinder is at the firing stroke with both valves closed, and piston about 10 degrees dead center, by marking on fly wheel with the spark retarded on the control lever on steering wheel. Take cover off distributor of magneto and turn armature so that wiping brush of distributor is in the center of segment where you wish No. 1 wire to lead from, and then put in place on motor, and insert other wires according how motor fires, following No. 1 wire.

584 An Insulating Compound.

From Insulation, Florida.—I want a formula for the insulating compound to pour into a metal box of dry cells, while hot; something like the compound used on the top of cells. Something that will cool quickly, will insulate and will not crack. I want to put dry cells in a metal box and then insulate them so thoroughly

that atmosphere changes will not affect them, so that they will be very slow running down while not in use. As you know, the National Carbon Co. sends out such boxes and they are satisfactory. I might use paraffine, but am afraid it is lacking in toughness and might crack in thin places between the cells, from vibration.

Reply.—For the purpose of "sealing" dry cells of battery, the composition should have a very low melting point, be waterproof and contain absolutely no moisture. The necessity of the low melting point arises from the fact that too much heat will have a tendency to evaporate the moisture held by means of blotting paper, etc., within the cell. It is a well-known fact that dry wood is an excellent non-conductor of electricity, while damp wood has just the opposite quality, almost perfect conductivity. This explains why dampness should be avoided. A composition composed of the following has the advantage of cheapness and will be found efficacious: equal parts by weight of yellow or pine tar, common resin and powdered blue talc or slate. The tar toughens the composition and prevents cracking. The tar and resin should be melted and the talc or slate stirred in.

585 Porcelain and Mica.

From Eugene Springer, Michigan.—Please state which is the better, porcelain or mica spark plugs, and why?

Reply.—Each has its advantages and its disadvantages. The most serious objection to porcelain is its brittleness and to mica the fact that its sometimes contains impurities or is liable to be porous and get filled with oil, both of which impair its insulating efficiency. Porcelain is more commonly used and gives more general satisfaction.

586 Magneto and Jump Spark System.

From Clarence E. Morton, Illinois.—I have a Mark XLVI Columbia with a make and break spark system, Remy Magneto, gear driven at crankshaft speed; low tension, alternating current, two electrical impulses at each revolution. Wire leads from the magneto to the switch and from the switch to a brass bar connecting the make and break plugs. Now I have added a jump spark system to this car with batteries for starting. It has a Milwaukee timer, Kingston coil, spark plugs and batteries. Now how can I use this magneto on the jump spark system? What changes will need to be made, what wiring, etc.? Have tried running the magneto current through the coil, but it would not work. What is the proper adjustment for a Model L. Schebler carburetor? Have fitted above car with an 1¼ inch size. Is that all right for a 4-cylinder 4-in. x 4½ engine, 4-cycle? The carburetor works well up to half open throttle, when opening the throttle seems to reduce the power and speed. What is wanted, more or less gasoline, or more or less air, or both?

Reply.—You cannot use the alternating current for jump spark ignition. Direct current only, such as is delivered by batteries or direct current magnetos or generating dynamos, will produce any spark of the jump variety. You would probably get better results with a 1-inch Model L. Schebler carburetor than a 1¼-inch, on a four-cylinder, four-cycle, 4x4½ motor. To adjust the carburetor screw the adjusting spring to the air valve hard down. Adjust the needle valve so that the engine will run idle at as slow a speed as needed. In other words adjust for slow speed first. Then as the throttle is gradually opened,

reduce the tension on the automatic air valve. The automatic air valve should not leave its seat on slow speed. You have like 95 per cent. of others, attempted to regulate for medium speed, with little or no attention to low or high speed adjustment.

587 **Chain and Sprockets.**

From L. A. Hudson, Illinois.—I have a two-cylinder Reo 1908 model car which has given good satisfaction until last fall when I broke the rear sprocket. I got new rear and front sprockets. Then my old chain didn't seem to work well on the new sprockets. I then got a new Baldwin chain. With this there seems to be a great strain on the chain when starting and it wants to hold to the front sprocket in starting up. I have adjusted the chain both tight and loose but this does not seem to help. I have looked it over carefully and I do not see why it does this. The sprockets are in line with one another. The chain that was with the machine was a "Diamond" and it gave no trouble until the sprocket broke. The Baldwin chain that I have now is a fraction narrower than the Diamond. Will you please tell me what I should do? Should I get a new "Diamond" chain, or is there any way I could remedy this one? My transmission is also losing grease from around the main shaft on the side next to the sprocket. I am using heavier oil which has helped some. In what way could I best remedy this trouble?

Reply.—Reo sprockets for 1908 models are cut for Diamond chains. The Baldwin chain will not fit Diamond sprockets. To prevent leaks in transmission use heavy transmission lubricant instead of oil, or put in a new bushing. Polarine lubricants are especially designed for such cases.

588 **Engine Loses Power.**

From Oscar Rinker, Illinois.—I have a Maxwell runabout, 12 h.p. 1910 Model, which has been running some over 4,000 miles and always been given the best of care. It was in good running order when put away last fall, and this spring when I took it out the first couple trips, it worked good, but after that I noticed it began to lose power and has been that way ever since. I have had the carburetor adjusted several times but it made no difference. I ground all the valves and they fit good. The compression seems to be good, but I can take and hold on the compression and there seems to be a hissing noise and the piston will gradually turn over easy, both cylinders being the same. The car runs fairly well on level good roads. I can make about 20 miles per hour, where before I could make about 28, and as soon as I start up a grade, the motor begins to die down, and all the throttle don't help any, it will only respond to about half the throttle. I have had the carburetor off and cleaned it thoroughly and the feed pipe flows freely. There also seems to be an unusual pound under the footboard which I can't locate; it isn't in any of the cylinders. The radiator also heats considerably more than usual. I have been thinking of taking the pistons out and examining the rings but hesitate doing this until I am certain that the trouble is there. Can the pistons be taken out without disconnecting the cylinders from the crank-case?

Reply.—Your compression that you say seems to be good, is far from good. Your valves may not be tight, may have ridges in them from using a breast drill or bit-brace instead of a screw-driver to grind them in with. It looks more as if you did not get the emery all out of the inlet, and that your rings, pistons

or cylinders were cut. This explains dying down when opening up the throttle. The pound beneath the footboard is possibly caused by a loose fly wheel. The heating of the radiator may be caused by the leaks in the cylinders. The more gasoline is consumed the more heat has to be radiated. The cylinders should be taken from the crank-case and the pistons removed for examination. A heavier cylinder oil might help you temporarily, although the pistons had better be removed forthwith.

589 **Engine Dies Down.**

From John Daly, New York.—Am driving a Buick model 17, 1910. When I leave the car standing, after having run slowly, and go to start again and open the throttle, the engine dies down.

Reply.—Looks as if the opening for fixed air in the carburetor was too large. If the car is equipped with a Kingston carburetor, drop a line to Byrne, Kingston & Co., Kokomo, Ind. If their diagnosis is the same as ours they will probably send you a small bushing to reduce the opening, creating more vacuum, to better vaporize the gasoline at slow speed.

590 **Stripped Gears.**

From J. Dudley Johnston, Iowa.—The writer has a model 32 Overland car which has made me all kinds of trouble with the rear axle. The driving pinion has been stripped three times with no cause whatever for it. The car has been used only around town here and has always had the very best care and the most particular handling, and the shifting of the gears on this account has always been done with the utmost care. Only yesterday the driving pinion was again stripped of one tooth. We have a good mechanic here who has put in these new pinions, but neither he nor the company who builds the car, seems to be able to give any reason for this stripping of the driving pinion. The car you will note is the sliding gear, 1910 pattern or model. The car at this moment is standing in my garage waiting for a new pinion, and before it comes and we put it in, I would be delighted if some remedy could be offered and a solution of the trouble made before the new pinion is put in. I ought to be fairly well posted in any trouble of this kind, but we seem to be up against "the real thing," in trying to keep teeth in our driving pinions.

Reply.—There are two causes usually for stripped cogs in driving pinions, letting in the clutch suddenly without releasing the brakes, and imperfect alignment. It is our opinion that in your case the trouble lies in alignment. All gears should run on their pitch lines, and bevel gears are no exception. If the axis of the driving shaft is above or below that of differential, the teeth of the pinion will not bear squarely upon the teeth of the bevel driving the differential. If the driving shaft is sprung, or either gear is mounted so it does not run absolutely true; the bearings are badly worn so there is any play vertically, either in the journal or cap, the cause of the trouble could be easily located. If the alignment is imperfect as a result of poor factory machining the manufacturers will no doubt make it right. If it is a result of wear it will need new and properly fitted bushings and possibly straightening shafts or refitting the gears.

591 **Defective Coil.**

From S. W. Hass, Ohio.—I have a Greyhound model 48 motorcycle. She is in fine shape only for one thing that I have been burdened with ever since

I got it. She misses on high speed. I have tried everything. It is in the timer, I think. Sometimes I get it running fine but only for a short time, then she misses again. I have put new platinum point on, new vibrator spring, and still she misses.

Then I have a two-cylinder Ford car which has been entirely overhauled, but she has got no power on high speed. As soon as I put it on high speed she dies down and finally stops. It has a Schebler carburetor and has good compression. Could the carburetor be too small? The cylinders are 4-inch bore.

What oil would you suggest for the motorcycle, light or heavy? My motorcycle has a vibrating spark coil. Could it be that she doesn't get contact enough in the timer, and that this is the cause of her missing, or does she get too much?

Reply.—Your coil is probably broken down, the condenser being burned out. The only remedy is a new coil or to screw the vibrator adjusting screw down hard and put a master vibrator and condenser into the low tension circuit, somewhere between the switch, battery and timer. The replies in this issue to C. E. Morton, Illinois, and Oscar Hinker, also of Illinois, would probably help you with your trouble with carburetor on your Ford car.

592 Baffle Plates and Oil.

From F. J. Seng, Illinois.—In my Welch 1909 touring car I experience considerable trouble with the oil getting by the pistons, creating a large deposit of carbon and shooting up the spark plugs in a very short time. The pistons were originally equipped with four rings and in replacing the rings about thirty days ago, it occurred to me that it might be a good plan to add an extra ring at the bottom of the piston, which was done. In spite of this fact the oil still gets by. I have used and experimented with various grades of oil, but without relief. It has just been suggested to me that baffle plates be placed in the lower part of the cylinder, leaving an opening sufficiently large to allow of proper movement of the crank rod. I wish to know if you have heard of cylinders similarly equipped and whether the baffle plate will prevent proper oiling of the bearings and lubrication of the inside of the cylinder.

Reply.—The use of a heavier cylinder oil might help you. You could cut down the quantity also probably to good advantage. If the lower ends of the pistons do not project below the ends of the cylinders, baffle plates such as you suggest may be used. If the pistons, however, "over-run" the cylinders you would have to use cupped piston oil deflectors. These or baffle plates would not affect the lubrication of any bearings except possibly the mist pin bearings, in case they are not lubricated through hollow piston pins from the walls of the cylinder.

593 Engine Growls.

From Charles L. Paine, California.—I live at the top of a hill a mile and a half high, and in coming down I am told it is a good plan to place my speed at low, with the gasoline nearly turned off instead of applying my brakes. The engine growls in a way that is trying to my nerves. Please tell me which is best, brakes or power as above.

Reply.—Your engine should not growl provided you close your throttle and shut off your ignition. Consult April and May numbers, also the present number of *The Automobile Dealer and Repairer* for information as to method of braking cars on hills.

594

A Weak Spark.

From J. W. Hazlett, Indiana.—I have a model 10 Buick, 1910 that has always given trouble at times. Have had several mechanics try to locate the trouble but they have failed. Have good spark plugs but can get but very little spark in the front cylinder and at times none. The spark is a little better in the next one, and good in the two back ones. When thrown in high gear it will jerk and pound along, and when making a turn or pulling a grade it will do the same. I always find the spark plug in the front cylinder very oily. Will you please tell me where to find the trouble?

Reply.—Trouble undoubtedly in the secondary wiring or distributor. See reply in this issue to Crawford Auto Supply Company, Iowa.

595

Camshaft Trouble.

Dr. H. C. Van Allen, New York.—I am driving a model Q Maxwell with perfect satisfaction excepting that the valves make more noise than seems to be necessary. Is there any way of preventing this condition? I have had my camshaft and connecting rods tightened so I am satisfied that the noise does not come from that source, and the spring between the uplift and the valve stem also seems to be all right. I am at loss to know where the noise comes from unless it is the seating of the valves. It seems to make considerably more when running idle. When the engine is running fast it does not annoy me so much.

Reply.—Your diagnosis of the troublesome noise is undoubtedly quite right. We know of no remedy except redesigning the camshaft to get an easier closing of the valves and less space between the valve stem and the faces of the cams when valves are seated. You might possibly reduce the clearance slightly by setting the camshaft gear back one tooth and adjusting valve lifts.

596

Double Trouble.

From the Crawford Automobile Supply Company, Iowa.—Again writing you a few lines about the trouble we have with our Reo car, we will say that it still fires on No. 4 cylinder with three spark plugs in. The cylinders fire 1, 2, 4, 3. No. 3 cylinder seems to get too much oil some way, and after it is run for a time will not fire. Sometimes it will fire for a whole trip, and the next day it will miss most of the time; especially when running on medium speed. If you get up speed to about 20 or 30 miles an hour, the cylinder will fire. Some of the troubles of this engine seem to be contradictory, but we will say that we examined the piston rings and the compression and these seem to be all right. There may be something wrong with the magneto, but we don't see how this can be the cause of the trouble. If there is a break in cylinder wall to cause this fire ahead of time, how can we locate the trouble or remedy it? We have tried everything possible, and if we can get a little more light from you, we will be much obliged.

Reply.—Your trouble lies mostly in the combined magneto and distributor. On page 66 of the June edition of this publication, you will note that the model D Splitdorf Magneto, with which your car is equipped, has three small wires leading from the magneto to the coil. These are primary or low tension wires. There is a single heavy wire from the coil to the center of the distributor and four heavy wires leading from the distributor to the plugs. These five wires are for the high tension current, which is completed

by the ground wire connected at A and A, which latter also may be used to complete the low tension circuit. The very fact that the current jumps from the coil to the speedometer chain, shows that the wire from the coil to distributor is insufficiently insulated. If it will jump to the speedometer chain, it will jump to any of the four leads to the plugs outside the distributor, or will bridge across inside the distributor if the oil is charged with brass chips or metal of any kind. The remedy may lie in running the wire from the coil to the distributor through heavy rubber tubing, or new heavier insulated wire may be necessary. If this does not help, the distributor will have to be cleaned of finely ground metal to prevent "bridging." The reason your No. 3 cylinder gets an excess of oil is owing to the missed explosions. It is quite unusual to fire in the order 1, 2, 4, 3. Examine your cams carefully and see if the engine does not fire 1, 3, 4, 2. The weak spark on No. 3 cylinder is accounted for by a leak in the secondary wiring. The firing of the cylinder with the plug removed is from flame in the exhaust igniting the unburned gas as it escapes through the lifted exhaust valve, opening as it does before the end of the power stroke. A gas with too little or too much gasoline will burn slow with a flame. We think that with proper adjustment of your carburetor for slow speed the firing in cylinders with spark plug removed will cease. Try reducing the amount of gasoline by lowering the float, as you have a Stromberg. Carburetors should be adjusted for slow speed first, and then for high speed. This may be one out of a hundred methods, as you say in a previous question, but to our mind it is the only method that "delivers the goods."

597 Transmission Systems.

From J. E. Baer, California.—I would like to know of you the following, for which I am inclosing you a stamped envelope. I have a Buick model 10, with planetary transmission. We have very hilly country and if it will work satisfactorily, I figure on putting in selective sliding gear transmission. I will ask you if such a change is made will it work as well as if the car was bought new with the selective transmission? Will I have to buy a new fly wheel also?

Reply.—We are afraid you will find it rather an expensive experience installing a selective sliding gear transmission in place of the planetary, with which the car is equipped. You will need a new fly wheel, clutch, and some important changes in speed lever connection. We do not believe you would get as good results as if the car were originally thus equipped, as you would not get the benefit of the Buick experiments, when they changed from planetary to selective sliding gear.

598 Coal Oil in the Cylinders.

From A. H. Ferrin, Arizona.—Please tell me how to insert coal oil through the carburetor of a 1911 Ford model T car. They are equipped with a Holly, and it has no visible air intake. I wish to clean my cylinders by flushing with coal oil but do not know how to go about it.

Reply.—The purpose of injecting coal oil or kerosene into the cylinder of a motor is mainly for freeing the rings which may be so gummed or clogged by carbon, as to prevent them from having their usual pressure against the cylinder walls, and thus cause loss of compression. Provision for this in the Ford model T is made in the removable cylinder head, which when taken off, allows the piston heads and compression

chambers to be cleaned of carbon very easily. For a kerosene treatment, however, you should take the spark plugs out and then pour a pint of coal oil or kerosene in each cylinder and let it stand a few hours, and then start the motor and burn it out. The oil in crank-case should then be drained out and a fresh supply put in, as a certain quantity of the kerosene will find its way to the crank chamber. Feeding the kerosene through a carburetor doesn't have much effect in cleaning the cylinders as it is partly vaporized and doesn't have time to dissolve the carbon, and will leave a sooty residue in the cylinders. With the Holly carburetor on the Ford it is impossible to feed oil through the air inlet.

599 An Engine Kick.

From G. E. S., Ohio.—I have a one-cylinder Reo runabout. When running along where it is smooth, say, 6 or 8 miles an hour, the car has a jerk. It is not due to the engine exhaust or impulse. The engine will make 6, 8 or 10 impulses, and then the kick in the engine takes place. The kick seems to be a forward jerk and I have thus far been unable to discover its cause or location. Perhaps you can enlighten me.

Reply.—Your complaint is probably caused by a worn and stretched chain or worn sprockets, which when the car is running will cause the chain to climb up on the teeth of the sprocket and then let go with a snap and will cause a jerk to the motion of the car. Trouble of this kind can be determined by jacking the rear wheels of the car and starting the motor, and then throwing in high speed to see if the chain don't have a tendency to jump the teeth. It will be more pronounced when a strain is put on the chain as when the car is in motion, and more so on a one-cylinder car, as the time between each impulse when running slow will allow a back lash in the chain. This can be remedied by a new chain, by new links in the chain or new sprockets as the case may warrant, or if the sprockets and chain are in good condition, the chain may be too loose, and tightening it may help it.

600 Nickel and Rust.

From a reader whose address is not given.—Will nickel plated lamps and trimmings on an automobile rust in the winter time if the car is not used? If so, would like to know what is good to put on the nickel to keep it from rusting. Would like to know if a two cycle automobile will use more gasoline in a season's run than a four cycle with the same mileage? Is a two cycle automobile engine better in a hilly country than a four cycle?

Reply.—Nickel will tarnish but it will not rust if kept in a fairly dry place. Most engineers think a four cycle engine is more economical in the use of fuel.

601 Magneto Information.

From Fred Ritner, Kansas.—I have a small ignition magneto for use on a stationary that I have never been able to get to work. I got it second hand and do not know the maker's name. At 2500 R. P. M. it gives a steady current of $2\frac{1}{2}$ amperes at 10 volts, and can be run up to 3 amperes at 14 volts. My engine is a jump spark with a Splitdorf coil which works fine with four dry batteries. Now what I want to know is:

1st, is this magneto made for a jump spark, or for make and break?

2d, if for make and break, could it be changed to jump and if so, how?

3d, if it is made for a jump spark why does it not work? The coil is a good one which will work on from 4 to 8

dry cells, and has been carefully tested out for shorts or leaks.

4th, is there any book which treats on the different kinds of magnetos and dynamos and gives their workings in detail, and if so where can it be procured?

Reply.—Your magneto being of the alternating type can not be made to generate the direct current. As the jump spark system can only be operated on direct current there is nothing you can do with it. Make and break ignition employs either type. Manufacturers of ignition apparatus will furnish you some excellent practical information if you will send to them for catalogues and other advertising literature. The columns of The Automobile Dealer and Repairer should give you some information if you will follow their Trouble Department closely.

602

A Heating Radiator.

From Harry S. Jennings, Connecticut.—I have a model T Ford touring car. It ran very nicely but heats up, if I run it, say 20 miles. It will begin to boil at the speed of 15 to 20 miles an hour. I have had the engine overhauled and all traces of carbon removed, but the trouble has not been overcome.

Reply.—The cause of water boiling in the radiator is insufficient radiating of the heat generated in the cylinders by the explosions of a mixture of air and gasoline vapor. In your particular case it looks as if too much gasoline were burned. This may result from any one or a combination of the three following conditions, viz.: Running with the throttle open too wide and the spark not sufficiently advanced, mixture so rich in gasoline that it becomes necessary to open the throttle wide in order to get power, or leaking exhaust valves which will cause more gas to be burned as in the previous condition. It is assumed that your radiator is kept filled and that the circulation is good, as else the motor would heat up. Radiator should of course be kept clean inside and out. When going up long steep hills using more gas the water will get very much hotter than on level roads, as you no doubt well know.

603

What Holds the Car.

From G. W. T., New York.—If, when going up a steep grade in low gear the motor stops and the car starts down hill backward and then you change into the reverse gear with the spark on and the car stops, what holds it? Is it the motor compression or do the gears lock themselves? It will not hold in the low gear ahead but will in the reverse. Is it because it is geared lower in the reverse?

Reply.—Probably from two reasons. The reverse is usually geared lower than the lowest speed ahead and the fast speed at which the motor is run with the throttle partly closed causes partial vacuum in the cylinder on the inlet stroke so that the charges of gas will not ignite. We think it would be safer to throw off the spark. Reversing the cycle and the charge of air drawn in at the exhaust stroke would be compressed and expanded at what would have been the power and compression strokes with practically no loss of power, and on the intake stroke the air would be forced through the carburetor. It takes very much less power to rotate a four-stroke-cycle motor rapidly backwards than ahead.

604

Starting on the Batteries.

From Charles J. Hull, Michigan.—I have just traded my Oakland Tourabout for a Krit Car 22½ h.p., gasoline tank behind and Bosch magneto. This carries 4 cylinder and has a Motsinger faultless plug switch on the dash with two wires from it to the magneto. The man I got it from bought it this spring. I took the spark plugs out and they were covered with carbon and I know the engine is very dirty for he took no care of it. He could crank it but I cannot. This is a car with a set spark, and they

are great cars for deep sand and good for bad hills, but I want to know just what will be my best way to do. There are no batteries on the car and I have simply got to have something put on so I can start the car easier. What can I use so I can start it on dry cells and then turn it to the magneto to run on? I need the car very badly and no garages are near. The little switch is very small; not over two inches square, I should think, and has a plug like a lead pencil through it. You will favor me very much to tell me how I can rig this up so I can get a spark the easiest and with least expense.

Reply.—We know of no way that you can start your car with dry batteries except you add a timer and four coils, or a distributor and single coil. If you were to replace your Bosch magneto with a Bosch of the dual type, and install a storage battery you could start on the battery. If you add the timer or distributor you will need another switch for that system, or a double throw switch in place of the Motsinger faultless plug single throw. The change would be rather expensive, the single coil and distributor being the cheapest while the change in magnetos would cost most.

605

A Hot Engine.

From Ben W. James, Iowa.—I have a model T Ford car. While on a short trip, having gone but four or five miles in which I climbed quite a steep hill, I noticed my engine was very hot; noticed also a noise as though a cylinder was running dry. As my indicator had shown the required amount of oil before starting, and I had also poured in three pints to make sure of enough, the evidence of running dry was a surprise to me. I found there was sufficient oil still indicated but poured in a quart more. My radiator was practically full of water but my fan belt was off, thus explaining in part at least the heating. After letting the machine cool, it ran better, though after running a few miles it rattled as though the connecting rods were loose. Upon returning home I took the machine down and found one cylinder dry, while the others were well lubricated as also the gearing. I had run the machine only about eighty-five miles since having it taken down because of a set screw coming loose in transmission brake drum assembly, and thus letting my entire transmission move or slip back and forth when slow speed clutch was used and frequently locking my transmission so that I could not crank the machine. When the machine was put together following this incident, the crank-case packing was poorly done, with the result that the machine leaked badly while in action, though the supply of oil was at all times sufficient for lubrication. I am unable to understand how the cylinder could have run dry. Will you please offer an explanation for this as well as to state how it is possible for the set screw controlling the clutches and gearing to come out if properly adjusted. Even though it were possible for this to be loosened and come out by injudicious use of the clutches, this could not have occasioned it as the machine had been used but little and that on level ground with but little use of and no particular strain on the clutches.

Reply.—The dry cylinder resulted from overheating caused by the failure of the fan to aid in the radiation. Of four cylinders the one in which the piston and rings fitted best all other conditions being the same, would be the first one to over heat. Oil will only stand a certain degree of heat. In this case the oil film between the cylinder and the moving piston and rings was dissolved by the extreme heat, and the resultant friction increased the heat. You were fortunate not to find the cylinder badly "scored." If the transmission is properly designed and the set screw correctly adjusted you should have had no such trouble as you seem to have experienced. We have no doubt but that, had the fault been properly called

to the attention of the agent selling you the car, the manufacturers would have made it good to you. The proper procedure in such cases is to leave the mechanism severely alone and let those responsible not only discover the trouble, but if their fault, remedy it.

606

Back Firing.

From John Goossens, Indiana.—I am having trouble with my car Maxwell Model G. The way it happened I made a trip of 250 miles and when I went to start my engine the next morning it fired back through the carburetor. Now I have got it so when I crank it fires back through the carburetor and it only hits on two cylinders and it is a four cylinder. When the car is in motion it jerks; it seems to me my valves are all in good order; they are all loose under cam shaft. The spark plugs are not cracked or anything.

Reply.—Firing back through the carburetor can only happen when the inlet valves fail to seat or the gas ignites before they are fully closed. If the cause is from the former the inlet valves are sticking in their guides. The remedy would be to ease them a bit. It is quite possible that a little kerosene squirted on the stems or into the cylinder around the valves will remedy the trouble. While at it see that there is not similar trouble with the exhaust valves. If the gas ignites before valves are fully closed it can only result from imperfect carburetion, the gas being too "lean" or too "rich," although the former is usually the fault. Your carburetor float may stick or there may be water or dirt in the gasoline.

The Muffler Cutout.

From C. W. Stryker, New York.—There is too little consideration given to the exhaust period by the great majority of automobile operators. And especially so when we remember that anything which interferes with the exhaust is a detriment to power development and fuel consumption. Mufflers, while they are a necessity, cause more or less back pressure on the cylinder, and just to the extent that they are back pressure producers, they are, of course, just to that extent, power killers. Therefore, just to the extent that the muffler cutout will relieve that back pressure, it is, just to that extent, a power producer—and it is more.

Among the many advantages of the muffler cutout, besides relieving the back pressure from the muffler, may be mentioned: Telling if the engine is working properly; preventing explosions in the muffler; if the engine heats, telling whether it is caused by back pressure from the muffler, or a clogged water circulation; helps in adjusting the carburetor, and is very efficient when used in place of the horn; if the engine gets to smoking, the smoke can be let out through the cutout instead of sending it into the muffler to clog it up, thus increasing the back pressure on the engine, with all its attendant evils.

Besides this the engine need not be run so hard to get the necessary power out of it, and there is much less wear on an engine working at its normal capacity than in one doing its utmost.

But the muffler cutout is of the greatest advantage when you want more power; when you are working the engine to nearly or its full capacity—any time when there is occasion to have the throttle wide open—because the main limiting point in most engines is that the gas cannot get in and out of the cylinder quick enough. It is well known that the amount of burnt gas remaining in the cylinder should be as small as possible so as not to contaminate the fresh charge and weaken the pressure of its combustion. That the better the quality of the mixture, the faster and more

completely it will burn, and that ignition may occur later in the stroke than would be possible with a mixture of poor quality.

That the passages through which the burned gases are led away from the cylinder must be large and free from obstructions, for if a free flow is not permitted back pressure will be set up, which will prevent the largest possible amount of gases from escaping, and leave a greater portion to contaminate the fresh charge; and the fresh charge that does enter being incomplete, and being contaminated by a portion of the burned gases that have not been able to escape, result in "choking up" the engine, in the production of lower power, and in the loss of fuel.

When you stop to consider that in running the engine up to speed that the exhaust and induction of a new charge occur from one to twenty times a second, it will be readily seen that anything which hinders the exhaust in being got rid of with the utmost rapidity and thoroughness, must materially upset the efficiency of the new charge, and as the efficiency of the new charge lessens the power of the next working stroke diminishes. Consequently the more back pressure the muffler cutout will relieve, the more power the engine will develop, and the larger will be the amount of fuel saved.

Theory and Fact.

From E. H. Metcalf, New Hampshire.—I note that F. J. Claussen has an experience to recount about breaking his crankshaft starting on the spark, also that several other gentlemen succeeded in showing that the strain of starting is theoretically much less than that of running under load. Many of your readers may feel that in balancing these conflicting opinions they should give most weight to the one based on fact and disregard the theorizing. Let me propound the following query to such as are inclined to feel that way. Let us assume that a discussion having arisen, certain parties wrote showing on theoretical grounds that a red-headed girl riding beside the driver could not possibly cause a greater strain on the crankshaft than any other passenger. Then Mr. Claussen or some one else wrote in saying that he had been riding one day with a large heavy man beside him who finally got out and gave his seat to a red-headed girl of much less weight. When the car was started the crankshaft immediately snapped. Would you consider that this proved that the theoretical gentlemen were wrong?

As a matter of fact parts like crankshafts which are subjected to repeated stress will break under a stress very much less than what they have endured in the past.

It would not be safe to argue from a crankshaft breaking under some particular stress that the stress in question was greater than any which had occurred in the past. It is easy to prove this by bending a piece of copper wire back and forth till it breaks. It won't take any more force to bend it the time it breaks than it did the first time, probably not so much. The pressure in the cylinders determine the stress on the crank, and this won't rise so high when starting as when running slow with open throttle and advanced spark on account of the initial compression being so much less. An engine won't stop in a position where the compression in any cylinder amounts to very much.

For the Leaking Rear Axle.

From F. A. Harris, New Jersey.—I would like to answer No. 553, from J. E. Baer, California. I am

driving a 10 Buick, 1910 Model. I had the same trouble with the grease coming out around the wheel. Take the wheel off and take out the felt pad and clean all the grease out of it with gasoline and then put it back. Or better, get a new pad and put in, and clean all grease out around the axle and brake band and place the wheel on again. Then drill a small hole, say 3-16 inch in the axle housing on the left side on the bottom between the differential and spring. That will let the surplus grease work out and he will have no more trouble with grease.

From Mason T. Beebe, Vermont.—Noting Mr. J. E. Baer's complaint of grease working out around the rear axle, I would say that if he will get from some paint dealer a piece of "varnisher's rubbing felt" and cut the same with a gasket cutter to insure a good tight fit he will find his trouble in that case eliminated. The point is that this particular kind of felt is much firmer than any other kind and can be had in almost any thickness. Had the same trouble but this method cured it completely.

He Favors the Spur Gear.

From William D. Troutner, Illinois.—Some people have a good eye and taste for certain designs of machinery and Mr. Pembroke appears to be one of that kind of men, but he should not think that his theories would carry him very far in some classes of machinery. I guess he has never taken into mind the friction of bevel gears as they are coupled up in a differential gear case. Now where I don't favor a bevel gear or bevel pinion is that they have several different bearings in the one gear. They have a heavy bearing and a light bearing, as the teeth are tapering or wedge shape and revolve in a climbing action. First, it will want to raise up in its mesh; this makes the bearings light on the small end of the teeth and heavy on the large end of the pinion; then the pinion will be out of its mesh line of travel. This makes it run hard and causes the pinion to wear on the teeth and the pinion posts, which hold them in place, and causes them to wear at bottom on one side and at top on opposite side. This then causes the pinions to lean out of mesh and run hard. Then it gives them a crowding motion, which causes them to raise against the hub of the wheel. This causes more friction. Why is it that Mr. Pembroke has not seen this? We can't get the motion on the spur gearing which will cause them to crowd endwise out of mesh, as the power of pull is the same at both ends of the spur pinion and gear. The result is that the mesh and pitch line travel is the same on the whole length of the pinion and gear. If we take into mind the different gearings, we can see that the bevel gearing has the most wearing and most friction on account of its spreading force, which the spur gearing does not have.

I favor Mr. Bobbitt's theories and the spur gear differential. Mr. Pembroke states that the bevels are just as strong and a better style of gearing. Will he explain why so many of them break so much more than the spur gear differential? He says the bevel pinions and bevel gears are easier to make and cost less to make them. As he is a machinist or mechanic I will ask him if he can take the rough bar of steel or iron and forge out a set of gears or pinions and then finish them by hand and not use any machine tools. If he will try this, I think he will find out that a spur gear is easier to make than a bevel gear. If he can do this with vise and bench tools and make the wheel by hand, he can then call himself a mechanic. Now if

Mr. Pembroke has never made a pinion or gear by hand, I will show him how to do it with only a hammer, forge fire, files and vise. He ought to know that a set of bevel gearing in an automobile, or any other kind of machinery, is a poor device of gearing. There are lots of people who favor the bevel pinion principle, but there are more who would not want it in even an ice cream freezer.

To Stop the Rear Axle Grease Trouble.

From J. B. Conners, Ohio.—In your June issue I note a query from J. E. Baer, No. 553, asking how to stop oil or grease from working through the housing of the rear axle. There is but one way to effectively stop this as I know from experience on three cars. The grease always works out at one hub only, usually the left hub. To stop it for all time to come, bore a $\frac{1}{4}$ inch hole in the bottom of the rear axle housing about midway between the hub and the differential. The grease will be forced through this and your troubles from this source will end for all time.

A Useful Instruction Book.

From George Smith, Illinois.—A friend of mine, Dr. C., the other night was stopped by a man that had just bought a second hand car. He had a blow-out and no experience. He did not know what to do, so stopped the Doctor and asked for aid. They found a tube in the kit, but no sleeve or shoe, and there was quite a hole to fix. When questioned what he had, he answered that all he could find was an instruction book, and his wife was reading up on what he should do. Next, the Doctor asked for the book, put it in the casing, pumped up and started them on their way rejoicing, so I would advise all to carry an instruction book as they are good for something sometimes.

Easy Driving and Handling.

The correct way to hold the steering wheel of a car is one which enables the driver to make any ordinary turn in either direction without removing the hands from the wheel, which permits easy access to the spark and throttle levers, as well as the speed shift and emergency brake, and at the same time is most comfortable.

There is absolutely no correct position for the hands on the steering wheel of an automobile that is adaptable to all drivers and all cars, for there are so many varieties in sizes and positions of the steering and control mechanism, and so much difference in the size and dispositions of drivers. When a good driver gets into a car and takes hold of the steering wheel he assumes the correct position and hold upon the wheel instinctively. Put him in another car and in the same way and he will perhaps assume another position and hold of the wheel, which will, nevertheless, be equally correct.

Duryea Secures Factory in Saginaw.

Charles E. Duryea has located his new company, the Duryea Auto Co., in Saginaw, Mich., where a steel building covering two acres, has been secured. Pending complete removal from Reading, Pa., the assembling shop in that city will be continued in operation. The new company, which is capitalized at \$300,000, has Duryea himself as its president and general manager. In addition to the Michigan men interested in the enterprise are R. S. Crawford, of Hagerstown, Md., who built the Crawford car; George T. Garbide, superintendent of Duryea's Reading plant, and J. P. Beck, a carriage maker who once was president of the Carriage Builders' National Association.

THE COMPRESSION PROBLEM.

How Theory Often Differs from Practice and Actual Results.

From Mr. Pembroke to Betsey Bobbett.—Your article entitled "A Problem in Compression" was read by me. I note the paragraph wherein you say that perhaps I can throw some light on this subject. While we may disagree as to the proper style of gearing for differentials, I quite agree with you that some special name must be found for the actual compression shown in a motor by cranking as distinct from the theoretical compression that should exist according to the laws of mechanics. I will offer an explanation, which is merely backed up by theory and some practical experience along the lines that you have tried out, and say that I think a great deal of the difference lies in the fact that we are unable to get piston rings and valves to set absolutely tight. It is probably an utter impossibility to hold absolute compression between the rings and the cylinder wall, consequently, we have losses in these directions that are far greater than we have any idea of. If you will take the trouble to plug up one of your pet cocks and then drill a 1-16 inch hole through the center of the plug by carrying over the motor, you will see that even this very small hole frees the engine of nearly all its compression, about as opening up an ordinary pet cock will do, although this 1-16 of a hole only contains one-fourth the area of the 1/8 inch hole usually in the pet cock. Now if we will again plug up this hole and drill a 1-32 inch hole in the pet cock, we will find that while we now feel the pet cock quite strongly, we will realize that it has been quite considerably reduced. This inability to hold off the pressure created by the closing in of the piston represents a very great proportion of our losses. Although the compression of the gases within the cylinder must and does generate heat, it also must be borne in mind that if the cylinder walls will radiate the heat from the expanding gases after ignition to the water jacket, they will also radiate a great proportion of the heat of our compression to the water jacket, thereby reducing the pressure below a point that would be indicated if such hit upon the losses from the compression by this means. I think you will find that the losses due to radiation to the cylinder wall plus the leakage of gas past the ill fitting rings and valves will represent the greater portion of the difference that you find between the number of pounds that Kent's man took and tells you should exist, and the amount that you can get to read on the gauge.

I notice you speak of the trembling or vibrating of the indicator hand. Although you do not say so, I assume that you notice that trembling or vibrating occurred when the piston was moving in on the compression stroke, or in other words, I believe it to be a fact that what caused the trembling was the leakage and reduction of compression and the ill fitting valves and ignition to the water jacket capable with the irregular motion of your stroke.

I am expressing myself in a manner which might cause those who want to be real technical, to infer that I want to dispose of these statements, but as I have in mind no way of proving the truth of the same, I simply offer them for any condolence that you may get from this strain of reasoning. I will also add that I have never been able to get anywhere near the theoretical proportion represented in the actual compression shown by the gauge.

I have found a better way, however, than a gauge for reading the pressure. I build a telescopic oblong box out of metal, the sides of which are hinged, and inside of this place I place a rubber bag which is connected to the pipe leading to the cylinder in an air-tight manner. Two arms pivoted from the top of the box to the sides

are spread apart by the inflation of the bag acting upon the sides forcing them out, consequently crowding the two levers further apart as the pressure increases. Then by attaching scales to the leverage of the arms, I could get more accurate readings than from the ordinary pressure gauges on the market.

That Compression Problem.

From N. M. Baldwin, Connecticut.—Replying to Betsy Bobbit, New York, the reason your compression shows so low is that your cylinder walls were comparatively cold, adiabatic compression being as you have stated, compression without loss of heat. Now the cool cylinder walls also the brass nipple used removed a large amount of heat, with the result that the compression was more nearly isothermal (compression at constant temperature). If your apparatus were perfectly air tight, heating it to the proper temperature, in this case about 450 degrees F., should give nearly the required pressure. While this is near enough for ordinary use, exact results should not be expected, as only in a well equipped laboratory with infinite care, can even closely approximate results be obtained.

THE ENGINE VALVES.

The Seating Angle and Its Relation to the Desired Opening for Best Results.

BY A. E. POTTER.

There are probably no parts of the average automobile gasoline four-cycle motor that get less attention by automobile designers, engineers and manufacturers, than the valves. In this day of perfection in motor art, with innumerable technical papers on kindred subjects, the valve itself seems to have been somewhat slighted.

Very much depends upon the valve design. How much, of course, depends upon the advanced refinement of design of cylinders, pistons, rings, connecting rods, carburetors, &c., all of which will get their full quota of discussion. The size of the valves and their location will be threshed out by those whose automobile engineer-

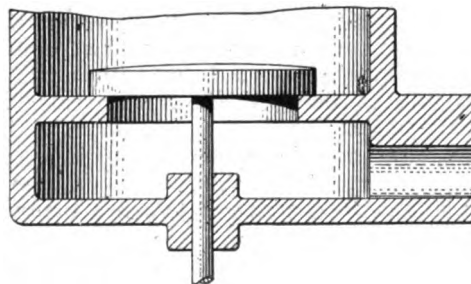


Fig. 1.

ing infallibility may be unquestioned, but having rid their minds of the two important features above mentioned, the real design of the valve itself is often left to chance. The material often does not seem to matter much, so long as it is of some sort of steel. The angle of the seat is usually 45 degrees, for no other reason probably, than that it is a convenient taper and the usual custom is to use a 45 degree seat. The larger the diameter, providing the valve can be kept tight, other things being equal, the more power any engine will develop, up to of course the limit in this direction.

Machine steel is usually the material selected, drop forged, machined, ground to the seat, and that is all. It is thoughtlessness on the part of many automobile engineers, and no doubt ignorance on the part of others, to not take into consideration the tendency of valves to warp under heat, particularly when made of machine

steel. Nickel steel, were it not for the extra expense of machinery, would make ideal gas engine valves. Electric welding of machine steel stems and nickel steel heads, have solved the problem, and very many automobile manufacturers have adopted this type, saving materially in machine work and adding efficiency to the motor.

The angle of the seat is a small matter at first thought. There are to-day very few manufacturers who put out motors with flat seated valves. Those of us who have

the valve can be figured as one of these sides, the desired clearance the other, and both equal, while the hypotenuse is the necessary lift to secure the desired opening. Suppose it is desired to have the opening $\frac{1}{2}$ inch clear. Then the necessary lift will be the square root of twice the square of $\frac{1}{2}$ or .707 + inches, a lift of over 40 per cent. more than the desired opening.

With the 30 degree seat the desired opening being $\frac{1}{2}$ inch, one of the two sides would be $\frac{1}{2}$ inch and the other one-half the opening. $\frac{1}{2}$ of $\frac{1}{2}$ inch or $\frac{1}{4}$ inch.

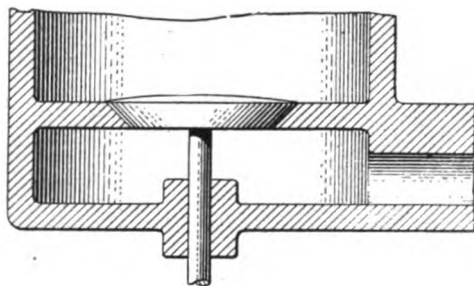


Fig. 2.

had our own troubles trying to keep such valves tight are quite sure to never adopt this construction in our ideal motor, and would hesitate before accepting a motor with flat seated valves. The strongest argument in favor of such a designed valve is that there is a greater area of opening with a flat seated valve than with one with the conventional 45 degree taper seat.

Fig. 1 shows a diagram of the flat seated valve. If this valve is lifted $\frac{1}{4}$ or $\frac{3}{8}$ inch it will give a larger opening between the valve face and seat than any angle

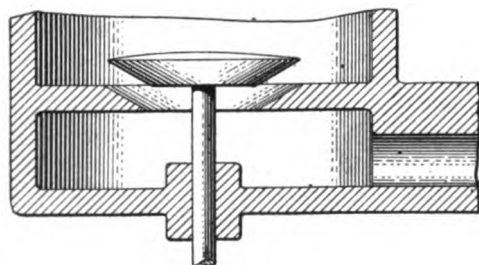


Fig. 3.

seat. Fig. 2 shows a diagram of a 45 degree valve seated, while Fig. 3 shows a valve with 30 degree seat. Figs. 4, 5 and 6 respectively show these valves off their seats. The strongest disadvantage of the valve in Figs. 1 and 4 is that the incoming gas and outgoing products of combustion are impeded, owing to the corners of the seat and valve, with consequent loss by frictional resistance.

In Fig. 5 it becomes necessary to lift the valve con-

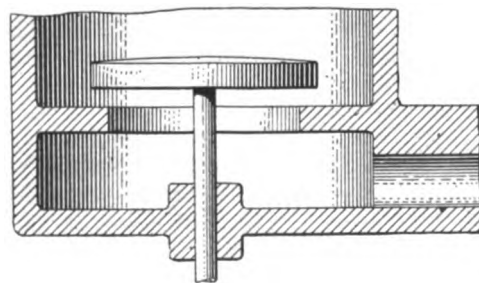


Fig. 4.

siderably higher in order to secure the opening in Fig. 4. Just how much higher is a simple computation, recalling the 47th problem of Euclid, where the square of the hypotenuse of a right angle triangle is equal to the sum of the squares of the other two sides. The seat of

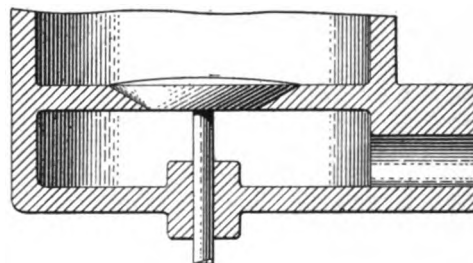


Fig. 5.

Fig. 7 shows the two right angle triangles diagrammatically projected. D C F represents the angle of the seat of the valve; A B the seat; A E the desired opening, and A C the lift. In the 45 degree valve A E is the same length as C E, while in the 30 degree valve C E is but one-half A E. We find, therefore that A C in the 30 degree valve equals the square root of the sum of the squares of $\frac{1}{2}$ and $\frac{1}{4}$ or .558 + inches less than 12 per cent. more than necessary with a flat seat valve and more than 21 per cent. less than with a valve of 45 degree seat.

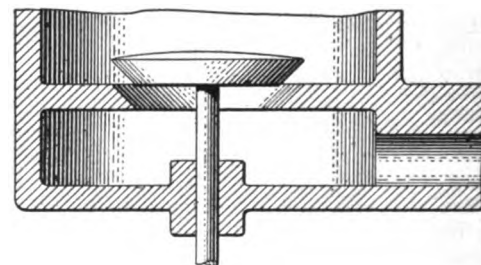


Fig. 6.

If there is any trouble to keep the 30 degree valve tight, or if any one has experienced any difficulty in this direction, I should very much like to hear from him through the columns of this magazine. Several cases have come under my personal observation where troublesome flat seated valves gave no trouble, after their seats were changed to 30 degrees, and showed no appreciable loss of power, the valve lift, as a matter of course, not being changed. In one particular case, in a marine

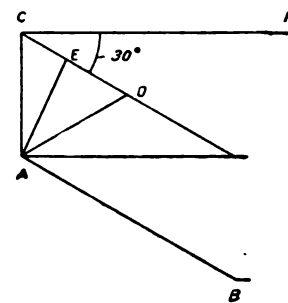
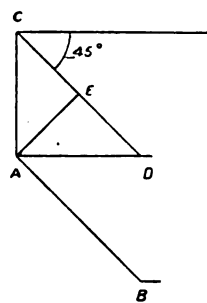


Fig. 7.

engine, the change in the valve seat added materially to the speed of the boat, the revolutions per minute being in excess of 10 per cent. higher.

There seems to be a tendency among some automobile manufacturers to allow too little clearance between the

valve stems and bushings or guides, while frequently the entire length of the valve stem is the same size. Both of these conditions can well be classed as defects of design, but thus classing them does not assist one particle should it ever become necessary or expedient to remove such an obdurate valve. As there are motor cars and motor cars, so there are valves and valves. There is one great consolation however, no matter how badly an engine or valve is designed, and that is when it runs and acts as it should.

Of all the little things however, that go to make a thoroughly good automobile motor, one of the most important, to my mind at least, is proper valve design, material and machining.

CARBOLITE OR CARBIDE.

How to Use It, What It Costs and Where to Place the Generator.

From O. H. Hampton, Indiana.—Carbolite and calcium carbide are the same thing, the two firms who manufacture it each having its own name for its product. There is practically no difference between the products of the two factories. Both pack their goods in the same sort of packages and there is no perceptible difference in the amount or quality of the gas generated. The only difference is in the price. The American Carbolite Co. sells its 100-lb. drums at \$3.50 f.o.b. at any of its distributing warehouses while the other firm charges \$3.75 per 100-lb. drum. Both firms exact cash with the order and charge the same price to everybody. Dealers have to pay the same price that a consumer pays. Both firms pack a special size for use in automobile generators (the one inch sized lumps), in 10-lb. cans, six cans to the case. This size is sold for \$3.75 per case, so 60 lbs. of this costs as much as 100 lbs. of the regular sizes. This one-inch size is not packed in any way except in the 10-lb. cases. It so happens, however, that they pack in 100-lb. drums, a size called "Nut" or $1\frac{1}{4} \times \frac{3}{8}$ inch which is as well adapted for use in automobile generators in which water drips on the carbide or carbolite, as is the special stuff put up in 10-lb. cans and sold at a much higher price.

As the goods will keep indefinitely if care is taken to keep the screw top lid on the drums, it is quite a saving to buy in 100-lb. drums. An inquiry addressed to The American Carbolite Sales Co. at Duluth, Minn., or to The Union Carbide Sales Co., Chicago, Ill., asking for a list of distributing warehouses, will bring a prompt answer, so the buyer can send his orders to the one most convenient to him. In ordering specify the "Nut" $1\frac{1}{4} \times \frac{3}{8}$ inch size. If ordering carbolite from The American Carbolite Sales Co., enclose check for \$3.50 for each 100-lb drum ordered. If ordering carbide from the Union Carbide Sales Co. make the check \$3.75 for each 100-lb drum. Send the order direct to the nearest warehouse.

The generation of the gas makes quite an amount of heat, so there is steam as well as gas generated. The steam condenses on its way to the lamps and if there are any sags in the pipe the water will collect in these low places and finally obstruct the free passage of the gas. As the pipes used are quite small it will not be long until the water will make trouble. The gas will be forced through the water and as each bubble comes through, the lamp flames will jump or flicker. For this reason place the generator in such a position that the water in the pipes will drain back into the genera-

tor. If this is not practicable a drain cock should be put in the pipe at its lowest point.

When charging the generator do not fill the "basket" or container more than one-third full; as a general thing the "ashes" or slacked lime will sift through the meshes of the basket bottom, but not always. If it does not sift through the ashes will more than fill the container as the slacking process increases the bulk a good deal. If too much is put in, it is quite likely to clog as the ashes have to find their way through the unslacked carbide; then the water wets the unsifted ashes, and after the dripping water has been shut off the unslacked carbide continues to draw water from the wet ashes on top of it making sometimes a good deal of waste. Ashes on top of the carbide makes the gas generation of gas irregular as the water has to first find its way through the ashes. The accumulation of ashes on the top of the carbide also greatly hinders the escape of the heat developed by the gas generation. Gas overheated develops a brown colored tarry substance which has a vile odor, and which has a tendency to stick to the inside of the pipes and to clog the burners. Overheated acetylene does not give good light either. When first starting the lamps it is well to leave the lamp doors open until the lights have become fully illuminating, because the first gas that comes through the burners is largely mixed with air and makes a very hot flame; so hot that it sometimes may melt the silvering on the back of the mirror reflectors. The air mixture may be detected by the small size of the flame and a purple haze around the edges of the white flame. All these things are doubtless well known to many of your readers but there are hundreds of new auto owners coming along every day.

Getting to Be a Horseless City.

During 12 hours on a summer Sunday in 1905, not a single motor bus was to be seen in the vicinity of Putney-bridge, whereas in 1910, under the same conditions, the figures indicate horse-drawn vehicles $7\frac{1}{2}$ per cent. and motor propelled $92\frac{1}{2}$ per cent. The actual number of public conveyances is smaller than it was, owing to the fact that the motor bus carries 34 passengers, against 26 by the horse bus. Of all the wheeled traffic, excluding cycles, across Putney-bridge on a fine Sunday in summer no less than 88.64 per cent. is now mechanically propelled. In the case of Fleet-street the change is almost as striking, the numbers being represented in percentages by 11.6 of horse-drawn as against 88.4 of motor propelled vehicles. The decreased space occupied by motor conveyances while dealing with a larger number of passengers is in itself an important gain to the London streets as helping to ward off the congestion of traffic. As a general result, it is shown that in 1907 the total number of vehicles observed was 9,977, of which 7,352 were horse-drawn. In 1910 the total had risen slightly, to 10,374, but the horse-drawn traffic had dropped to less than 5,000, while the motor traffic had risen to approximately 4,000.

Packing the Battery.

A fitting which will ensure batteries from rattling in their case consists simply of a strip of lath of some good hard wood, to which is screwed or riveted a double-ended spring blade made of a piece of spring steel. One or more of these wedged between the battery and the side of the box will keep all firm and prevent rattle and damage. The wooden part should be next to the battery, the spring pressing on the sides or top of the box.

Directions for Prest-O-Carbon Remover.

The idea of putting Prest-O-Carbon Remover into the cylinder of an engine is to fill the entire compression space with liquid. This can best be done by bringing the piston to the firing point when both inlet and outlet valves will be closed. The carbon remover can be introduced into the cylinder through the opening into which is screwed the priming cup or spark plug, whichever is situated at highest part of cylinder. If the construction of the engine is such that this operation does not completely fill the compression chamber, you can take a piece of small copper tubing, solder one end to a small funnel, —the other into the barrel of an old spark plug; then by screwing out the spark plug of the valve cap and screwing in this improvised funnel, bending the tubing (if necessary) to such shape as will bring the mouth of the funnel above the top line of your cylinder, you can fill the entire space in the head of the engine. It is best to let this liquid remain in the cylinder for one hour or more, according to the condition of the engine, and then remove it with an oil gun and save for use in the other cylinders.

Returning all fittings to their proper positions, start your engine, opening the throttle wide, and let it run on a retarded spark until the exhaust ceases to throw off a blue smoke. Treat the other cylinders in the same manner.

After cleaning all cylinders, examine the carburetor, cleaning it, if necessary. A certain portion of the carbon remover will find its way into the crank-case mixing with the lubricating oil, which will cause the engine to over heat if run for any great length of time; consequently it is absolutely necessary that you drain off oil from the crank-case and fill it with fresh oil. If the construction of the crank-case is such that you cannot completely drain it, the same results can be accomplished by flushing.

The action of the Prest-O-Carbon Remover is to soften and loosen all of the carbon deposit with which it comes in contact, which the heat of the engine dries and the violence of the explosions break up and discharge through the exhaust. It penetrates into the valves, softening and dislodging such carbon deposit as may be there, and if the valves have not been burnt and warped out of shape, will put a motor back on its good behavior. Of course, if the valves or their seats are warped, they will have to be ground in.

Army Officer's Narrow Escape.

Lieut. J. R. Bannister, of the United States Army, lately stationed at Leavenworth, Kan., is blessing the Hudson "33" these days. Without it he would have overstayed his leave, have been left behind when his regiment started for Wisconsin, and have risked imprisonment. Mr. Bannister had been away on a furlough, and had missed the owl car from Kansas City to Leavenworth, on which he had relied to take him over in time. He could find no liveryman who would start a horse on the 26-mile trip with less than three hours to make it. At last, however, he dropped into the Hudson garage and found the night man willing to try. The 26 miles were made in the dark over an unknown road in one and one-half hours, reaching Leavenworth just as the regiment was defiling into the train.

Mr. Coffin's Degree.

Nine years ago Howard E. Coffin, designer of the Hudson "33" and of four other successful motor cars, was compelled to leave the University of Michigan, within six months of graduation, because he did not have money enough to complete his course. Three years ago President Angell sought out Mr. Coffin and told him that if he would write a graduating thesis the University would

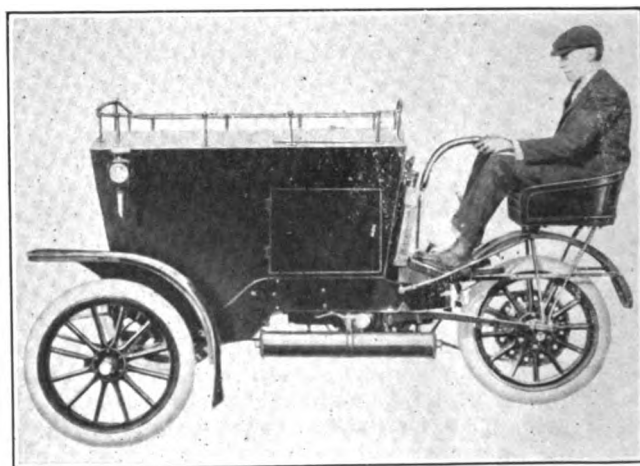
confer upon him his degree. For three years Mr. Coffin, try as he might, could not get a chance to write that thesis; he was too busy doing things to be able to give much attention to receiving things. At last, however, he forced himself to take the time, and on June 28, he read his thesis and received his degree.

To Keep the Hands Looking Well.

To those who wish to keep their hands in good condition and at the same time work about a car unhampered by gloves, etc., the following suggestion may be of some use: Before starting to do anything to a motor car, it is a good plan to fill the nails and crevices around the same with soap, and the fingers may also be rubbed over with the same material. This prevents the dirt securing positions from which it is most difficult to dislodge it. A great deal of the dirt that does adhere may be removed by rinsing the hands in kerosene or stale gasoline. To rub the hands in vaseline and put a few drops of ammonia into the hot washing water is a useful plan.

A Handy Small Delivery Car.

The C. W. Kelsey Manufacturing Co. of Hartford, Conn., have produced a new model of an economical and small delivery car, which they call Model N. Department stores and other concerns who have large though light delivery problems are most anxious to install economical and rapid delivery motor driven cars, which can handle a greater number of packages more economically than the old horse and wagon method. Customers want their purchases delivered at the earliest possible moment, and the merchant, too, is most anxious to accomplish this end. The logical solution is a parcel delivery car capable of speedy and frequent deliveries, which, while not carrying large



Motorette Delivery Car.

loads, can move a much greater amount of merchandise through its speed and simple handling. The length of the Model N is 9 feet overall and the width is 5 feet 3 inches overall. The height from the top of the carrier to the ground is 4 feet 3½ inches. The package carrier is 4 feet long, 31½ inches wide and 27½ inches deep in the front part. The frame is dropped in front, which allows of large package carrying space. The package box contains 28 cubic feet and is designed to carry 500 pounds. It is loaded and unloaded through large double doors located in front. In addition to this there is a door on each side. There are also double doors on top, directly in front of the operator. The power plant is readily accessible through the side doors. When these are opened, it will be noticed that the metal floor is in two sections and that these sec-

tions lift up on hinges. By folding them back the transmission engine, etc., are completely exposed. It is equipped with 3-inch automobile tires on the front wheels and a 3½ inch automobile tire on the rear, the rear wheel being 29 inches in diameter rather than 28. It is operated from a single seat directly over the rear wheel, and a speed of 20 miles an hour. The simplicity of the Model N, its few parts and its ease and simplicity of operation, make it economical to run.

Due to the exceptionally large demand for Motorettes, the C. W. Kelsey Manufacturing Company of Hartford, Conn., has increased its capitalization from \$250,000 to \$1,000,000. Having secured all the available space in the old Cheney Silk Mill Building, it has been found necessary to build a large addition, upon which work will begin at once. Motorettes are now being turned out at the rate of 15 to 20 a day.

METAL TRACKS FOR AUTOMOBILES.

Just what the highway of the future will be in view of its enlarged scope and the varying, not to say conflicting, traffic which it is now called upon to provide for, no one can with assurance foretell. Since the automobile became a common vehicle of traffic many of the main travelled highways are being used three times more than they used to be, and when they are subjected to high speed they wear out rapidly, although if driven slowly automobiles benefit rather than injure the road.

But whether it is the amount of travel or the kind of travel, the roads contiguous to the large cities and towns are in pretty bad shape, and to keep them in good condition is going to cost much, possibly more than the people will stand for even though they know that good highways add more than they cost to the value of the adjoining real estate.

Some of the European journals are suggesting steel or other metal strips or rails for the automobile wheels to run on, and the matter has been discussed in this country but without much idea as to what would be the expense of such a system of highways or its possible conflict with the necessities of horse drawn vehicles, for these of course, must still use the highways for traffic. The advantages and disadvantages of such steel tracks are many. Let us make a fairly comprehensive summary of them:

They would make pneumatic tires no longer necessary.

They would do away with the necessity of shock absorbers and of delicate and easy springs.

They would allow the weight and strength of the car to be greatly reduced.

They would reduce the fuel fully one-half now necessary to propel the car.

If the plates or tracks were flanged in some way to prevent the car wheels from leaving them, they would not only make travel safer but obviate the necessity of the present constant care on the part of the driver in keeping the car in the road.

They would save a good deal in both cleaning and repair of the car.

On the other hand, while the disadvantages would be fewer in number than the advantages, some of them seem rather formidable if not prohibitive:

The original cost of such rails and their placing on a permanently smooth and level foundation might make their expense too heavy.

They would be objectionable to horse-drawn traffic.

They would present something of a problem for cars that are driven at different speeds as it would be

necessary to have places where one car could pass another going in the same direction.

The necessary double track system for cars going in opposite directions would occupy a good share of the present highway space and leave little room for other vehicles, although with such tracks the width of the chassis might be slightly reduced.

In any event, the matter is worthy of consideration and possibly some discussion. We have scarcely scratched the ground, pro and con and would be glad to hear from some reader who is capable of giving the subject more practical and scientific consideration.

The automobile has added new problems to road construction and maintenance that have not yet been solved. The sooner they are settled the better.

Brake Care and Efficiency.

Probably every car driver is aware that the efficiency of a brake falls rapidly immediately the wheel is locked and caused to slide. Up to the point of locking the braking power naturally increases, and to get the maximum effect from the brake system it is obviously desirable that each brake should be capable of application up to, but just short of, skidding of the wheel.

In order that both brakes should give these results it is naturally essential that the compensation should be perfect. The word "compensation" applies not only to the pull given to the brake mechanism, but also to the condition of the braking surfaces. If oil gets on to one brake surface it is obvious that that brake is not likely to skid the wheel, and it will be found, if great pressure be applied with the lever or pedal, the other wheel will be easily locked without the brakes as a whole being very effective. A careless driver will not take the trouble to notice that it is only one wheel that skids, and will imagine that he has reached the limit of effectiveness of his braking system.

To correct this it is necessary (and the same should be done from time to time as a matter of precaution) to test the brakes on some steep hill and notice whether one wheel is more prone to lock and skid than the other. If this be the case the brake surface on the wheel which does not skid should be examined and cleaned, or, if the brake system be not compensated, the brake in question should be adjusted so that when skidding occurs both wheels skid at the same moment.

A Handy Route Book.

An automobile touring book with maps and routes for all the states has been issued by the Splitdorf Magneto Co., and it is just about what has long been needed, being low in price, and devoid of the interminable and annoying detail that usually cumber the average route book. There is just enough to it for the average car owner who wants general directions concerning main travelled roads. It also contains a well prepared digest of the motor vehicle laws of the various states and territories. It costs but 25 cents, is substantially bound in boards and a copy will be sent to any one asking if he will enclose the quarter, mention this magazine, and address C. F. Splitdorf, Walton Avenue, New York. The man who cannot easily get anywhere he wishes in any part of the country with this book in his pocket, would be decidedly dull.

A Clogged Muffler.

From William S. Tongate, Indiana.—In answer to C. N. Herbert, Nebraska, who describes a knock in his engine, his trouble seems to be a clogged muffler. Remove the muffler and take it apart, cleaning it thoroughly, and your knock in your motor will disappear.

BUYING A CAR.

Things the Purchaser Should Be on a Careful Look-Out For.

A London, England, automobile expert gives some advice to prospective car purchasers which will apply the world over. He begins by saying that "no sane motorist of experience would now recommend offhand any particular make of car to a valued friend. Such progress has been made in uniting and balancing various constituents for the production of a satisfactory result that only personal idiosyncrasy could warrant one in declaring that any particular feature or features in a car constituted that car the best.

"One quality, however, as desirable as it is neglected and mysterious, must be sought by practical trial. Cars differ much in the degree to which, positively speaking, they hold the road, or, negatively speaking, they jump its inequalities. The causes of the difference do not appear to be known—at least if they are, the initiated of the trade make a secret of them. Yet nothing conduces more to the pleasure and comfort of motor driving than the feeling that all four wheels are adhering to the road all the time.

"The qualities which make a car hold the road well on ordinary surfaces at reasonable speeds are qualities which raise it into a higher class of choice worthiness than that of cars, otherwise of equal excellence, which are less well endowed with the virtue. But to ascertain this actual trials must be made under like conditions without the assistance of skilled salesmen, who soon become expert in the art of imperceptibly easing a car just when it is on the point of betraying a vice.

"It is a question whether similar practical trials should not be made to enable a chooser to discriminate between disk or plate clutches and the more common cone in its varieties. In a great proportion of cases it would be judicious to recommend a tentative appreciation of disk and plate clutches before accepting whatever may be found operating in a generally eligible *tout ensemble*. Buyers, therefore, have to bear in mind that many a feature of the stock model is there for the sake of the maker's profit and need not be accepted as an established excellence just because it reappears in many designs.

"So, though the average standard is high, and individual examples are full of remarkably similar characteristics, there remains room for a certain liberty of choice which would be worth exercising if opportunity and information permitted an intelligent judgment to be formed. Still, the cars of the year are generally so successful that the choice is no longer fraught, as it used to be, with issues demanding sometimes extremes of personal solicitude. Every purchase should be a good purchase, though the ideal harmony may be missed in many cases.

"It is indeed calculated to nerve the interested reader to visit the nearest reputable agent and embark on the choice of a motor car forthwith, confident that whatever befall him no serious disappointment is to be apprehended. Yet he may well ask if there be not one definite factor that must be determined before the embarrassments of selection should be encountered. The answer is that there is one—and one only—of an invincibly prosaic description. Till the weight to be carried and the speed to be generally attained have been reduced down to terms of wheel and tire diameters, and thence to pounds, shillings and pence compared with the funds available for purchase

and upkeep, it is futile to start choosing a motor car.

"Nor is the case one of plain economics merely. It is possible to have on a car wheels and tires up to one's work and within one's limit of expense, yet the car itself may be so constructed that the machinery will never run at its best except at a speed which is uncomfortable except on the smoothest roads. Now there are very few smooth roads left just now. Happily many indications make us hope that a few years hence surfaces will have been so restored and reconstructed that the new volume of road traffic will not be penalized by the ruts and pot holes now so prevalent. The car of our choice to-day must, however, be tired for rough travelling.

"It is only a bit of salesman's mockery when a car designed for 810x100 millimeter tires is certified to give its best output at between forty and fifty miles an hour. But if the wheels and tires for the given work and expenditures are first ascertained, it then becomes practicable to consider the chassis which will put that work and expenditure to the most alluring advantage. It seems somewhat disillusioning to base the choice of a motor car on the manner of its being shod. Yet, according to some good judges, more momentous quests may be started wisely, and not altogether undelectably, from the cardinal fact that the subject is adequately and suitably shod."

Oil and Tar.

At this time of the year tarring and oiling operations are in full swing in many districts, and complaints are constant as to the damage done to the paint and varnish of cars which are driven over the tarred stretches before the tar has had time to dry. Not only so, but in many cases the dressing of fine gravel or chippings is either badly spread or very thinly spread. Indeed, in some cases nothing is thrown on the tar at all. Now it is obvious that the only way to minimise tar splashes is to go very slowly, but even when this is done the chances are that, in nine cases out of ten, black spots will be found on the body panels, wings, and elsewhere, and the motorist is often surprised at this when he reflects how slowly he drove over the tarred surface, and he is almost inclined to think that he might just as well have run over the oil and tar at a higher speed. As a matter of fact, this is not the case. The slower one goes over the tar the better, but the harm is as often as not done immediately after the tar has been past, as the driver quickens up instantly. The treads of his tires are covered with tar and grit, and this flies off at once owing to the rotation of the wheels. What should be done is not only to drive slowly over the tar, but to accelerate very gradually after it is passed. If the car be kept dead slow after the treated stretch of road has been crossed the dust of the untarred road very soon absorbs the tar on the tires, and instead of being flung off radially, it will drop away gently and without being thrown at the car.

Worth Knowing.

An easy way to locate a missing cylinder is to stop the motor and touch each cylinder with the head of a match. The cylinder that has been refusing to do its work will ignite the match.

There can be little doubt that the manufacturer who seriously attempts to meet the present demand for silence without adopting worm gearing imposes on himself a very great and unnecessary handicap. Good results can be obtained with bevel gearing, but better can be obtained and maintained with worm gearing.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

STEAM CAR OPERATION.

Hints That Will Serve to Make It Successful and of Little Trouble.

From Frederick L. Smith, classical master Penn Charter School, Philadelphia.—After nearly six years successful experience with two White steamers, one an '06 eighteen h.p. machine, the other a "M. M." 40 h.p. car, I am convinced that most of the trouble to steam machines results from the neglect of relatively simple matters, due to ignorance of what is going on in the production of power. Water, to produce steam, is carried in a tank. The piping, pumps, checks to convey this water to the generator, or boiler, is called the water line. Gasoline, to heat the water, is carried in a tank, under air pressure. The air pump to produce the pressure and the piping to convey the fuel, the vaporizer, to change the liquid gasoline to gas, ready to mix with air, and burn under the generator is named the fuel or gas line. When the steam is made there is a steam line to convey the power to the engine. If there is trouble at all, it is likely to be in the gas line, or the water line. It takes a mighty brief inspection to determine whether the fire is burning or not. Indeed a man who cannot attend to a fire which practically governs itself in these days had better confine his attentions to a wheelbarrow.

We are all familiar with the bathroom device by which water is automatically heated at any hour, day or night by simply opening a faucet. The action of the water turns on the gas, and a thermostat cuts it off, when the desired temperature is reached. This device will work for months without the slightest attention. They are to be seen in quantities in any gas supply window. In a steam car, as in a bathroom, the supply of water is necessary to start the fire. It is, therefore, of the utmost importance that the water line is working perfectly from one end to the other, and especially that the water is kept clean and free from oil. In this line is a little strainer. It may be removed and cleaned in two minutes, as special provision is made for this in the piping. Yet drivers confess that it is often weeks without attention. Water is used over and over again. Some oil from the cylinders is brought back to the tank and condensed. The tank should be flushed out when the water is warm after each drive. All that is necessary is to let water run in the tank and out again. A little kerosene in the water will keep the check balls in the pumps from becoming covered with heavy grease. With constant attention to these obvious matters I have run a car all summer without any attention to the check valves, or pumps, except for setting up the packing now and then.

The vulnerable point with many in steam cars is the generator. The coils are burned out by excessive heat. The coils of my old car were absolutely perfect after four years of service. Here again a little common sense is all that is necessary. Each night after a run, I open a valve, made for this purpose and blow all the

steam out of the generator. The last of the steam is fresh from the fire and at 600 pounds pressure, the generator is left absolutely clean. Water follows from the tank and is ready for firing up next day without using the hand pump. After steam is up and the car is ready for the road, one important point must be remembered. The throttle which starts the car in action, starts the engine, the pumps and the water, and, as explained above the fire. Now the water has not yet quite reached the generator in quantity sufficient to prevent the tubes becoming very hot. A glance at the temperature gauge will show this at once. It always happens within the first mile or so of running. All that one has to do is to cut off the fire by hand for about 30 seconds or a minute. This allows the water to cool the hot tubes and all danger of burned out generator is obviated by practical common sense. One does not order a suit of clothes of a tailor and expect it the same day. One ought to know it takes a moment for the water to reach the generator and if the fire has burned too vigorously, the temperature gauge shows this condition, and it is as natural and easy to avoid overheating as it is to turn down a smoking lamp.

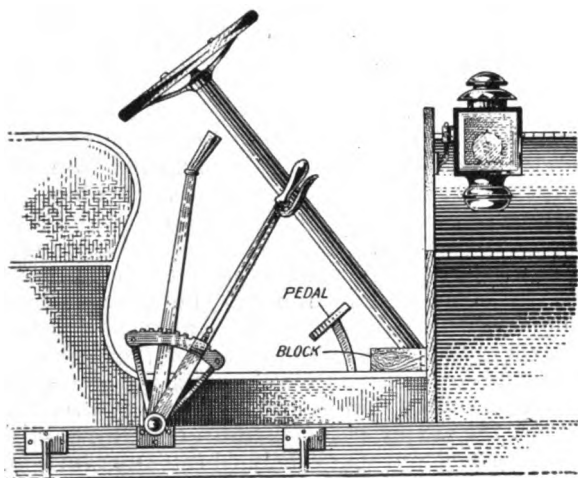
Twice my car manifested, on a long trip, what might be called whimsical behavior. It climbed one grade beautifully, but on the next acted sluggish, to the point of almost quitting, and again on the same day on a level stretch. The trouble was in the check-ball, which after more than a year's service had worn a groove. Sometimes this turned over and did not hold the water. A new ball remedied the defect at once. Again a defective rubber tube from the tank to the pump left minute particles of decayed rubber on the checks and made the water supply irregular, and consequently, the car steamed poorly. A new piece of hose remedied the defects. Most of the trouble will be in the water line and practically all this will be due to a neglect of obvious fundamental cleanliness. I make a trip from Philadelphia to Eastern Maine, nearly eight hundred miles with practically no attention to the machine aside from the simple matters I have indicated and the attention to lubrication which are common to all types of cars. Steam cars are ball-bearing throughout and may be neglected with greater immunity from trouble for a longer period. But there is nothing which helps any car more than careful attention to its oiling system and all grease cups.

I trust these points will be clear to every reader interested in steam. They are comprehensive and cover the ground of possible trouble. That they are sound is proved by the fact that after more than 25,000 miles of travel extending through five years, by attending to these simple matters I have never had any of those troubles with generator and steaming qualities of the system, which have turned friends of steam into its bitterest foes. In the hope that those who still like the quiet efficiency of steam, as a motive power, in spite of the time required to get a car into action, I have written these ideas, based entirely on a long experience. I have seen and heard of steam troubles galore and in most cases I have been able to trace them to obvious neglect of fundamental simple principles. I was fortunate in having at the outset a teacher who thoroughly understood a White steamer and who was able to point out clearly what was going on all the time, and the relation of these functions to an easy running car.

More automobiles are in actual use in the City of New York than in any entire State in the Union.

Hooking up the Links.

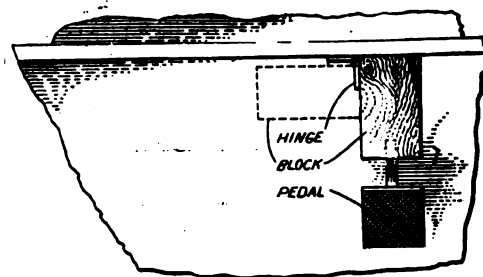
From J. F. Jenckes, M. D., Massachusetts.—W. B. P. Vermont, wants to know how to "hook up" the links



to his Stanley car. I had a Stanley car and devised a way that was fairly satisfactory at a cost of a few cents.

Press the reverse pedal up to the point desired and

make a wooden block to fit in ahead of pedal, to prevent it going too far. Attach far end of block by a hinge in such a way that it may be pushed aside by the foot for reversing. To "hook up" press the foot against pedal up to the point desired and hold with the



From above.

foot. I found a marked difference in use of steam which was noticeable when water was low in the boiler, allowing a more rapid filling. The block should bind on the floor just enough to keep in place when needed, but allow of easy removal by foot.

Total yearly expenditure for the maintenance of motor cars in New York City is \$93,400,000.

Free Working Plans for a Garage.

The Pitless Auto Turntable Co., 1501 Grand Avenue, Kansas City, Mo., offer in our advertising department to send free working plans to parties desiring to build a garage. They say these plans are complete in every detail and designed to meet a flexible range of requirements both as to size and building material to be chosen. But read the advertisement and you will understand just what they propose to do.

Oil in Arcadia.—Have you ever heard of Arcadia, that land of pleasant fancy? It is in Arcadia that the pretty shepherdess lays aside her ribbon-trimmed crook to make the toothsome cheeses from the foaming milk of her ewes. Life is very sweet and very simple in Arcadia, but many of its joys we know aren't there. The joy-compelling automobile never sends its cheery honk-honk along on Arcadian zephyrs. There is another Arcadia that isn't a land of fancy but a plain, every-day fact, with automobiles a-plenty in its prosperous, well-paved streets. So from this Arcadia of the Land of the Living comes the following to the makers of Panhard Oil: "I have been using your Panhard Oil for three years and don't want to make any change. Am planning on a trip soon through Iowa, Illinois, Indiana and Ohio and would like addresses of dealers in these states handling your oil. Please send same with your book on lubrication and oblige, G. H. Kinsey, The State Bank of Arcadia, Arcadia, Neb."

In a recent interview, Mr. Haws, the maker of Panhard Oil said: "Yes, Mr. Kinsey wanted to know the dealers on the way and there are hundreds of other oil users asking the same question. When Panhard Oil makes a customer, Panhard Oil never loses him. It makes good both to owner and dealer. Panhard Oil will not foul exhaust valves, spark plug or piston rings if properly used. For 35 years we have studied oils—we are oil experts—and Panhard Oil is the result of this expert knowledge. Both for the dealers' and owners' sake I wish all men selling a lubricant, on all roads between here and Arcadia, were Panhard dealers

—then there would be better automobile satisfaction all around."

Are You Tired of Polishing Brass?

If so you will be interested in the announcement in this issue of the Arsenal Varnish Company, 2501 4th Ave., Rock Island, Illinois. They say with "Arsenal Liquid Gun Metal" on your lamps and radiators you have no polishing to do. This preparation is applied with a brush the same as paint or varnish and makes a lasting gun-metal enamel on all brass parts. It can be removed at any time without injury to the brass. But consult their advertisement and ask your dealer for this preparation. If he does not have it the manufacturers will send it to you direct. They have a system for painting cars which they want to explain to our readers.

Color Barometer.—The American Lava Company of Chattanooga, Tenn., has recently brought out a neat little device which they call a "Color Barometer." This barometer if hung in a well ventilated room where it comes in contact with the outside air will indicate correctly they say the coming changes in the weather. If the trousers turn blue the weather will be fair. If they turn pink it indicates coming rain. If they turn lilac look for a change in the weather. We understand that one of these barometers will be sent free of charge to any reader of The Automobile Dealer and Repairer who will write for it and mention this paper.

Autolac in Pint Cans.—In response to requests from a large number of owners the finish of whose cars is in good condition except the hood and fenders, the Autolac Mfg. Company, 916 Huron Road, Cleveland, Ohio, has added pint cans to their standard packages. One pint can contains a sufficient amount of Autolac to refinish the hood and fenders of any car and will be sold at the price of \$1.00. But consult their advertisement on another page, cut out the coupon attached and send your order on that.

The Phelps Trouble Finder.—Those of our readers who want to investigate the merits of the "Phelps Trouble Finder" should consult the advertisement in this

issue of the New England Equipment Company, Warren Chambers, Boston, Mass. It is said that thousands of users now endorse this "Trouble Finder." It is said in many cases to quadruple the life of the spark plug and to increase the intensity of the spark.

Gas and Electric Vulcanizers.—The McEwen Vulcanizing Co., 378 Jackson Avenue, Long Island City, N. Y., come before our readers this month with a brief description of their gas and electric vulcanizers, adapted, as they say, "to the proper vulcanization of leather, rubber and fabric treads." There is said to be positive control at all times with no steam and leaking at joints and an economical consumption of gas.

The Heitger Carburetor.—The Heitger Carburetor Company has been compelled to seek larger quarters in order to take care of its rapidly increasing business, and is now located at 1170 Beecher Street, Indianapolis, Indiana, where they have a modern factory equipped with the best of machinery and with a capacity of 1500 motor cycle carburetors weekly, and soon they expect to be able to turn out at least 1000 automobile carburetors per week.

Seamless Steel Tubing.—This is made by Edgar T. Ward & Sons, 23 Purchase St., Boston, Mass., and is especially adapted to the uses of automobile and cycle manufacturers and for a great variety of mechanical purposes. See their announcement on another page and in writing to them mention The Automobile Dealer and Repairer.

Ford Timer Attachment.—In this issue the Spengler Optical Company, Geneva, New York, has an announcement of their "Ford Timer Attachment." The manufacturers say in their circular "the most vital part of an internal combustion engine is its timer. It is the very heart of the machine. Your carburetor may get out of adjustment or a plug become fouled and usually these can be remedied, but let the timer go wrong and you simply stop. This device is made strong and in a workmanlike manner." Full particulars concerning it can be had by writing to the manufacturers.

A New "Red Head" Spark Plug.

Notwithstanding the large number of different makes of brands on the market, the announcement of a new spark plug never fails to arouse the interest of motoring enthusiasts.

The 1912 type RED HEAD Spark Plug recently announced by the Emil Grossman Co., 250 W. 54th Street, New York, caused somewhat of a furore, because of the excellent reputation for efficiency created by achievements in successful motor boats and automobiles since the inauguration of the RED HEAD in 1912.

While the original RED HEAD proved satisfactory, in two years a number of refinements suggested themselves to the engineers of the Emil Grossman Co. These improvements were for many

batteries from a generator driven from a variable speed source are: the failure of the generator to pick up, ruining of the batteries and the unreliability of mechanical speed controlling and voltage regulating devices.

In the design of the Matchless system these difficulties have been overcome by using a permanent magnet generator and a controlling device which is something more than an automatic cut-out. The charging current is regulated and the absence of all mechanical speed control or electrical voltage regulating devices makes the equipment extremely simple and very reliable in operation.

The use of a permanent magnet generator is made possible by the unique electric controller which comprises a part of the Matchless system. The controller has four distinct functions, as follows: To connect the battery to the generator when the voltage of the generator has reached the point where it will charge the battery. To limit the current through the battery to the normal charging rate. To disconnect the battery from the generator whenever the voltage of the generator is less than that of the battery. To prevent the connection of the battery to the generator when the car is driven backwards.

An 80 ampere-hour battery is used with the small size and a 100 ampere-hour battery with the large size, and on account of the fact that it is impossible to overcharge the battery with this system, any first-class storage battery can be used.

This equipment has been subjected to the most severe trials, both in the laboratory and in actual service, and is offered as a lighting equipment which, in point of durability, simplicity, and reliability, is equal to the automobile itself.

The controlling device is the invention of Mr. Albert E. Berdon, the well-known electrical instrument expert. The controller and the generator were designed by Mr. Berdon and Mr. J. W. Esterline, who was formerly in charge of the Department of Electrical Design, Purdue University.

A Sample Free.—The J. P. Davies Company of Dayton, Ohio, are making a soap especially for the purpose of washing automobiles. Perhaps you have had experience with ordinary soaps and have found that they destroy the luster of the varnish or paint. This soap the manufacturers state is made especially for painted and varnished surfaces and will not in any degree injure them, but will enable a car owner to keep his machine in excellent condition at a very trifling cost. The J. P. Davies Company have so much confidence in their soap that they want to send a **sample cake free** to every reader of this paper, who will write for it at once and mention this notice in The Automobile Dealer and Repairer. We might say further that it is a distinct disadvantage to use either benzine or gasoline for cleaning car bodies, because either one of these substances will ruin the paint or varnish very quickly. Many people, however, do not seem to know this.

Edelmann Tire Gauge.—This tire gauge tells you the exact pressure on your tire at all times and is guaranteed to be correct within two per cent. The advantage of knowing just the amount of pressure on a tire will be recognized by most motorists. Too much pressure

is bad for the tire and so is too little. Every motorist should learn as soon as possible just what pressure his tire requires to do the work properly. The price of this gauge is \$1.50 and it will be sent to any address, or if you want further particulars, write to E. Edelmann & Co., 51 W. Kinzie St., Chicago, Ill.

A New Electric Rear Light.

We illustrate a new electric rear or tail light which is designed to be attached to the number plate or the body of the car. This light can be connected to the sparking battery and it cannot blow out. Many car owners who read this publication will doubtless be interested in getting further particulars con-



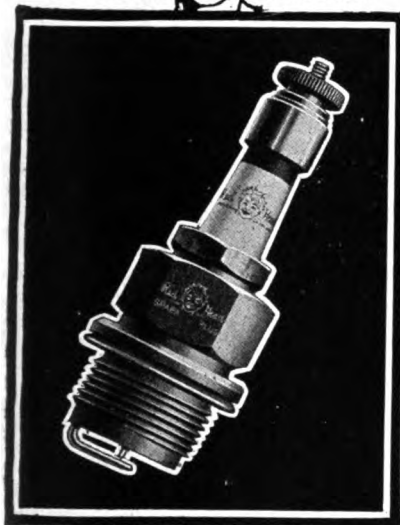
New Electric Tail Light. Manufactured by Holt & Beebe, Boston, Mass.

cerning this handy device. Any who may be interested should write to the manufacturers, Holt & Beebe, 40 Sudbury Street, Boston, Mass., not forgetting to mention The Automobile Dealer and Repairer.

The Davis Milling Attachment.—The Hinckley Machine Works, Hinckley, Ill., manufacture the Davis Milling Attachment and Compound Table, a tool which should be found in every repair shop doing very much business, no matter where located, but consult the announcement on another page and write for prices and further particulars, mentioning The Automobile Dealer and Repairer.

Rubber Cement.—In this issue will be found the announcement of the Quality Cement Company, Fernwood, Pennsylvania, giving particulars about their rubber cement. They say the hotter the weather the better this cement sticks. It is made especially for repairing automobile and bicycle tubes and tires and they claim it will do anything in the way of cementing. It will cement rubber to leather and will hold all plugs, patch hot water bags and rubber boots, etc., but see their announcement. In ordering mention The Automobile Dealer and Repairer.

Lock Your Cars.—We have been advising our readers for a good while, when they have occasion to leave their cars for a few minutes in the street, to lock them. In this issue F. H. Kelsey & Co., 408 Frankfort Ave., N. W., Cleveland, Ohio, have an announcement of the "Saunders Auto Lever Lock" which they say prevents "joy riding" or unauthorized handling of the machine. With this lock your car can be left with safety upon any thoroughfare or in any public place or garage, without fear of auto thieves. As this device is inexpensive we recommend our readers to send for further particulars or perhaps an order. This device is absolutely guaranteed, we understand, to do the work claimed for it or the money will be refunded.



months thoroughly tested by the leading gas engine engineers and as a result of such tests were adopted by the manufacturer for the RED HEAD plug.

On the 1912 plug the metal discs and packing that take care of expansion and contraction of the center electrode, are sealed within a brass cap crimped under the shoulder of the porcelain—this eliminates loss of compression and blow-outs. A longer porcelain has been provided—that eliminates short circuits. Also a two-piece bushing, part of which is a flexible cone seat; the more the bushing is turned down, the tighter the joint. The 1912 plug has a blue oil-finished body, heat treated—that harmonizes with the finish of the motor and does not "freeze" or rust.

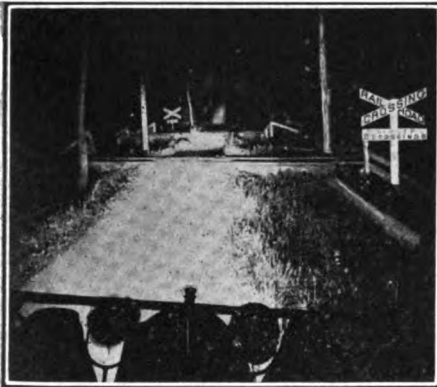
During the past year, large quantities of RED HEAD plugs were exported to South America, Mexico, Porto Rico, Canada, and dealers and motorists are invited to write for literature. In writing mention this magazine.

A New Electric Lighting System.

The Matchless Electric Lighting system for automobiles and motor boats, manufactured by The Esterline Company, La Fayette, Ind., possesses some unique features and advantages. The difficulties which have hitherto been encountered in the charging of storage

A Night Light Scene.

The accompanying photograph is the most successful, genuine "night scene" ever taken in which the illumination for the picture was furnished by the electric headlights on an automobile. The print shows a double-track dangerous railroad crossing, brought out in the searching brilliancy of the automobile headlights. The scene is several miles west of Indianapolis, on a much traveled cross road. The photograph is absolutely genuine. The only light used was that from two 16 candlepower headlights. The camera was set up in the tonneau of the car and the plate exposed for about three hours. The plate shows the view absolutely as it appeared under the illumination of the headlights, without being aided by a



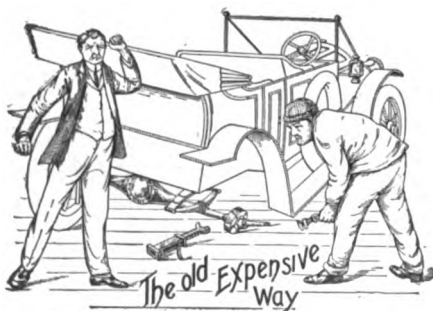
flashlight or touched in any way after printed.

The light for the view was furnished by the Remy Magneto Light, a new device of the Remy Electric Company of Anderson, Ind., which supplies ignition and electric lights, by one magneto. A storage battery is automatically charged by the device and when the magneto is not running the battery takes up the lighting load.

The rays from the electric lamps were so strong and of such a range that the finest type could be read with ease in the light at the farthest point on the hill in the background more than four hundred yards from the motor car. Many scenes of a similar nature have been taken, but in the majority of cases, extra equipment has been used to strengthen the light and the plate had been retouched to make the light appear stronger than it really was.

An Auto Jack on Wheels.

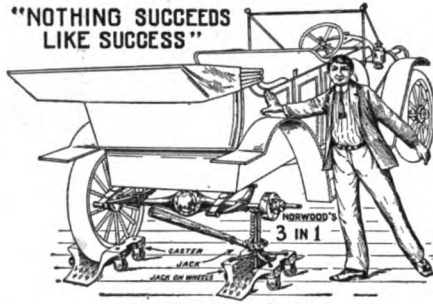
The illustrations give a better idea than words of one of the most comprehensive devices for handling automobiles



in the garage of anything yet on the market. It is simple, small, light, and does anything and everything necessary, enabling you to push the car about while on the jack without danger of falling or other trouble. The manufacturers claim, and apparently with reason, that the

Norwood Jack will fill the place of three indispensable devices, a caster, a turntable and a jack. It will pay to look into this and get all the facts and the price which are decidedly attractive.

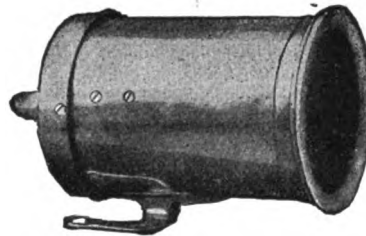
"NOTHING SUCCEEDS
LIKE SUCCESS"



Address the Auto Accessories Manufacturing Co., 408 Continental Building, Baltimore, Md.

An Effective Automobile Whistle.

The whistle illustrated herewith was designed for automobile use especially where space is limited and a horn is not desired. The tone is clear and penetrating and will effectually clear the way. This horn works from a few dry batteries or a six volt storage. The size of the horn is 6x3 1/2 inches and the price is extremely



A Good Automobile Whistle. Manufactured by the Edgar Mfg. Co., 104 H. Hanover St., Boston, Mass.

reasonable, as it is sold by the manufacturers to car owners on the mail order plan.

Write for price and full particulars to the Edgar Mfg. Co., 104 H. Hanover Street, Boston, Mass., and in writing mention this magazine.

Weiland Supplementary Carburetor.

This device renders frequent gear changes unnecessary and is equally adapted for use on an automobile or a motor boat. Being automatic in action it supplies a correct mixture independent of the speed of the engine. You can throttle down in crowded traffic to run slowly on the magneto, and your engine will be amply supplied with fuel. In other words you can run your car on direct drive from a crawl to its maximum speed. It makes your old carburetor "self-priming" without waste of fuel or dripping of gasoline. It will start your cold motor even in freezing weather on the first complete cycle without any attention. The simple closure (not opening), of the throttle on stopping your motor will make your engine almost sure of starting on the spark. The manufacturers claim that it will make your engine develop from five to twenty-five per cent. more power as shown by better pulling on hills and more speed on the level. It is also claimed that it will make your old carburetor from ten to twenty per cent. more economical. It will indicate the level of the gasoline in the float chamber and also allow you to observe the thorough vaporization of the

fuel when the engine is running. Still further particulars concerning this device together with price which is very moderate may be obtained by writing to the American Die and Tool Company, 2nd & Buttonwood Sts., Reading, Pa. In writing kindly mention this paper.

Plowing by Night.

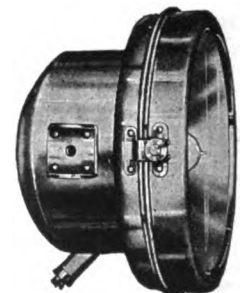
"The K-W Ignition Co., 37 Power ave., Cleveland, Ohio, whose advertisement appears on another page of this issue, is offering a unique electric lighting outfit for gas or steam tractors. This outfit consists of a magneto to generate current for electric lights, a pair of head lamps with bulbs, together with switch and wiring. The magneto generates current direct for the lamps,



Model U L Low Tension Magneto.

without the intervention of any storage battery or charging device or other complicated connection, and can be installed readily by any blacksmith. The magneto is furnished with a friction wheel so that it can be mounted to any moving part of the engine to get the proper speed, which is about 3,000 R.P.M. The wiring is very simple, and full instructions accompany the outfit.

The usual practice is to use one head lamp in front and one in the rear for the plows. If engineer desires an inspection light, the company can also furnish this as extra. While this outfit is extensively used on steam tractors it is highly advantageous for gas tractors, inasmuch as the current from the magneto can be used for ignition in the day time when lights are not on. Full information regarding this outfit and other products of their manufacture, will be

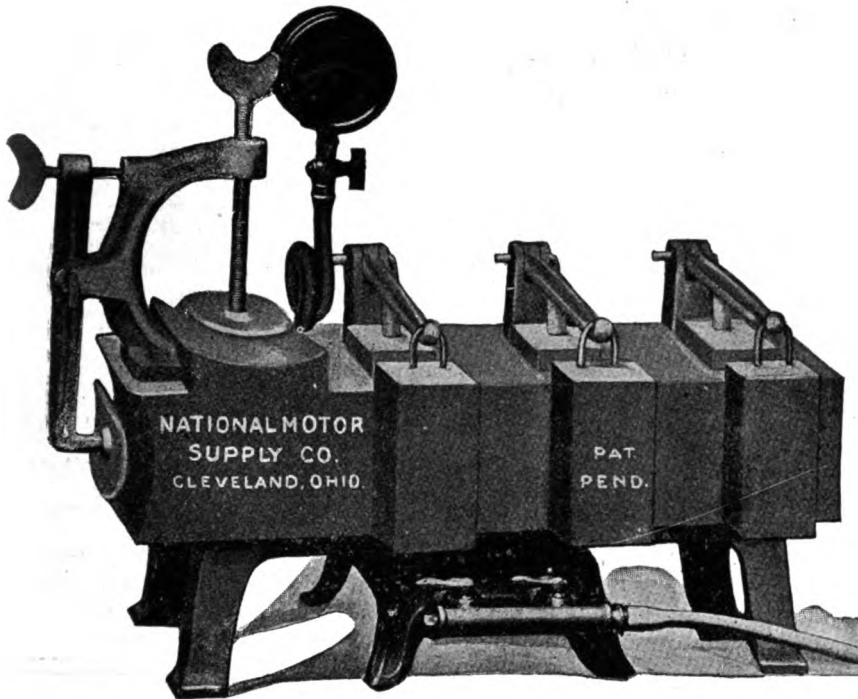


Electric Headlight.

furnished upon request to The K-W Ignition Co., 37 Power ave., Cleveland, who make a full line of magnetos and spark coils, as well as the lighting outfits.

Puncture Indicator.—In this issue the Baltimore Auto Specialty Mfg. Company, 506 and 508 M. & M. Bldg., Sharp & Baltimore Streets, Baltimore, Md. come before our readers with an announcement of a "Puncture Indicator." This is a little device which gives instant warning of a punctured tire, and its value cannot easily be over-estimated. Running a machine with a partially collapsed tire not only wears the tire out rapidly, but in case of speeding there is liable to be an accident. As this device only costs 75 cents, every car owner can of course afford to have one.

VULCANIZERS



National Garage Vulcanizer

For nearly a year we have been working and experimenting on a garage vulcanizer which we could sell cheap, and yet have it repair several tires at once. We now have it perfected, and everybody says it is a wonder. We are giving the garage man a vulcanizer with which he can repair two casings and three tubes at a time at less than half the price charged for other vulcanizers of similar capacity, and when an article is guaranteed and manufactured by us, you know it is right. This Vulcanizer is very compact; it is heated by either natural or artificial gas. It can be lifted off its base and set on a gasoline stove, or it can be attached to any steam boiler. It is made of cast steel throughout, and is equipped with the very best steam gauge, safety valve and filler plug. If you have enough work to keep this machine going full capacity, it will earn you from \$40 to \$50 clear profit per day. Your garage is not complete without it, and you can pay for it in a few days' profit. **Price all complete, \$50.** Write for dealer's discounts.

National Steam Vulcanizers

For individual car owners, to repair both tubes and casings at home or on the road. This Vulcanizer which we have been manufacturing for three years is too well known all over the world to need much explanation. You can thoroughly repair your own tires in a few minutes, and make them wear three times as long as usually. No danger of burning them with **Steam**, which is the only method of vulcanizing properly. Price for complete outfit of all supplies and instructions, \$12.00.

WRITE FOR TEN DAY FREE TRIAL OFFER.

Manufactured by

The National Motor Supply Co.,

1920 EUCLID AVENUE

CLEVELAND, OHIO

Please mention the Automobile Dealer and Repairer when writing to advertisers.

The Star Speedometer is said to be a well built, mechanical speed indicator and odometer. Send for booklet to the manufacturers, the Star Speedometer Company, Milton, Pa.

Five Booklets Free.—In this issue will be found the announcement of Valentine & Company, 257 Broadway, New York, manufacturers of Valentine Vanadium Varnishes, especially for automobiles. It is more difficult to keep the finish on an automobile than upon a horse drawn vehicle for a variety of reasons, therefore the varnish for automobiles should be selected with the greatest care. The Valentine Varnishes manufactured by Valentine & Company have occupied a leading position hard on to a half century. The five booklets referred to as stated in their advertisement make a pretty good library on Automobile Painting. They describe several systems of finishing, including Valentine's Celox Four-Day System. But turn to the advertisement, cut out the coupon, fill in your name and address and mail it to Valentine & Company and the booklets will be sent to you free of charge promptly.

The Prest-O-Tire Tube.—The Prest-O-Lite Company, 251 East South St., Indianapolis, Ind., has an announcement in this issue of their Prest-O-Tire Tube. They say that at a cost of twenty cents this little tube, a foot long, and an inch in diameter, pumps a flat tire 36x5 in an

instant. Just attach the valve and turn the thumb screw and the work is done. These outfits are for sale by dealers, but if your dealer hasn't it write direct to the company. It would seem to be a good thing for every motorist to carry along in his car.

Harvard Storage Batteries.—These are made by the American Storage Battery Co., 1777 Broadway, New York, or Albro Street, Cambridge, Mass. Write for particulars and prices. Superior advantages are claimed for these batteries.

Tops, Wind Shields, Seats and Bodies.—The Grand Haven Auto Body Company, Grand Haven, Michigan, make a specialty of seats and bodies for any car, as well as tops, wind shields, ammeters, lamps, tanks, fenders, etc., but consult their advertisement and in writing to them mention The Automobile Dealer and Repairer.

The Geysco No Cement Patch.—This patch is manufactured by the Geyer Sales Company, 444 Bimm Bldg., Dayton, Ohio, and is said to require no cement or acid to patch punctured tires. These patches are all of the best Para rubber and it is said they will not work loose when the tire becomes heated, but consult the advertisement. The company is making a special offer on trial patches.

Brazing.—In this issue will be found the announcement of the Springfield Brazing Co. 12 Willow Street, Spring-

field, Mass. They are expert brazers, cast iron, malleable iron, copper, aluminum, brass, steel, etc. They advise readers not to throw away broken parts either large or small, no matter what the shape, but communicate with them as they can make them stronger than ever at a very small expense.

Inner Tube Protecting Webbing.—In this issue will be found the announcement of the Waban Webbing Company, 104 Essex St., Boston, Mass., giving particulars of what they call "Bullet Proof Inner Tube Protecting Webbing." They say it is as tough as old oak and as flexible as a glove, and affords a simple and logical way of eliminating punctures and blow-outs. Their advertisement is worth looking over by every man who runs a car. Send for their booklet No. 2 and it will give you full particulars.

Automobile Bodies.—The Borbeis Auto Co., 2109 North 9th Street, St. Louis, Missouri makes a specialty of all styles of fore-door automobile bodies and also of two passenger bodies. They are making running gears as well and can furnish all kinds of front and rear axles. Consult their advertisement on another page and write to them for catalogue, mentioning this paper.

Subscribe to the "Automobile Dealer and Repairer," \$1.00 Per Year.

A TRIFLING FAVOR.

We have to live in this world to some extent, all of us, by helping each other and it is surprising sometimes how much good a single individual can do by a few kindly words expressed to some friend.

We are anxious to double our subscription list. Manifestly if each one of our subscribers would mention our publication and its merits to two or three of his friends and only one of them should subscribe, our ambition would be realized. Each present subscriber saying just enough to some friend to induce him to become a subscriber would double our subscription list. The benefit would not be altogether ours either, because every subscriber we get enables us to do just so much more for all of our readers. Our special offer of fifteen months for one dollar (the regular rate being one dollar a year) still holds good and the money may be sent in any convenient way. A dollar bill is just as good because we guarantee the receipt of all money sent to us for subscriptions.

We hope every subscriber who takes the trouble to read this little item will favor us by telling his friends what he thinks of The Automobile Dealer and Repairer.

Rattling Noises.

Although most cars of recent make run extremely silent, yet they sometimes develop small rattling noises very difficult to locate. One of these is occasionally due to slackness in the fit between the bonnet and the frames it rests on at each end. Some bonnets are held down by spring catches which should prevent any rattle, and in many cases the frames on which they rest are lined with leather, but if this be not the case strips of leather or felt can be stuck on to the bonnet frames with glue or secured by means of rivets. Another common cause of rattle is the undershield, and this often vibrates at certain speeds so as to come into contact with oil-pipes or other parts and as they vibrate they tap against the undershield. An

elusive rattle was traced to a bolt which had been left in the undershield by those responsible for the assembling of the car. The speedometer-shaft is often responsible for quite a loud noise at certain speeds.

BALL MULTI-SPARK PLUGS



Give a hotter spark than any other plug made and therefore explode a thinner mixture of gas. Therefore more power and less carbon.

Bear these points in mind and insist upon no other in your motor equipment.

Sold by good dealers everywhere.

Price, \$1.50.

Booklet and descriptive matter for the asking.

The Plug with a Guarantee.

THE BALL MULTI-SPARK PLUG CO.,

927 HENNEPIN AVE.,

MINNEAPOLIS, MINN.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Open End Mosler Triumph 50¢ Competitive Plug

These plugs are designed to comply with the requirements where open end plugs are compulsory, or where a satisfactory high grade article is desired, at a price which makes Spit-Fire Plugs prohibitive.

The Triumph Plugs combine superior workmanship and perfect material at a minimum expense to the buyer. We are placing them on the market backed by our guarantee, that, for workmanship, material, efficiency and durability they are absolutely unequalled by any other open end plug before the public to-day.

Deep recess in the insulator. — Porcelain guaranteed to be hand turned.

Absolutely gas tight.—Pure asbestos wicking.

Stuffing box construction makes replacements easy.

Your dealer or jobber.

Direct on receipt of price.

As good as any—

Better than many.

To buyers who send in coupon to us attached herewith, we will sell **3 Triumph Plugs for a dollar.**

3 Plugs for a dollar will be sold only to holders of coupons. Otherwise, Triumph plugs are 50c. each.

\$2.70

A. R. MOSLER & CO., 163 West 29th Street, New York

Sole Owners, Patentees and Manufacturers of

WORLD FAMOUS SPIT-FIRE PLUGS

Also Sole Manufacturers of

The Successful Breech Block Plugs

"The Plug with the Handle"



TRIAL ORDER
Good only until August 1st
3 Triumph Plugs for \$1.00
Send this coupon with your
remittance to
A. R. Mosler & Co.
163 W. 29th St.
New York
A. R.

The Center-Studded Woodworth Tread.

The Leather Tire Goods Company have just brought out a new Woodworth Tread which they call the Center-Studded. This tread has the latest quick adjusted fastening which will be used on the Woodworth Treads for 1912 and differs from the other Woodworth Treads in being made of somewhat lighter leather and having the steel studs only on the center portion which



Center Studded Woodworth Tread made by the Leather Tire Goods Co., Niagara Falls, N. Y.

comes in contact with the road. This tread is designed especially for use in cities or on comparatively smooth roads where there is nothing to wear the sides of the tires. For use on trucks, taxicabs or other vehicles which will not be used in the ruts or rough roads of the country districts, it is equal to the full-studded Woodworth Treads.

The Center-Studded Tread is light in weight and low in price. Like all Woodworth Treads it is fully guaranteed not only to give good wear but also not to injure the tires in any way.

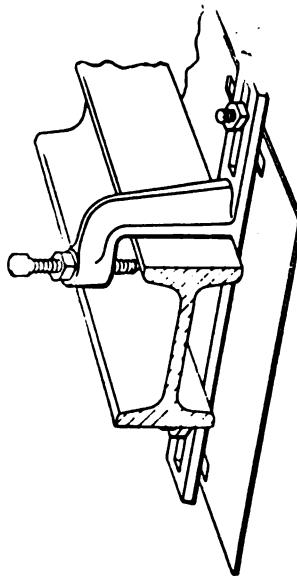
A New Solder in Paste Form.—Do you remember, when you were a youngster at home, watching the plumber mending the leaks in the pipes, wires or kitchen utensils by melting his solder through contact with the hot iron and soldering stick? You probably observed him with a great deal of interest and curiosity and thought his work picturesque and mysterious; but it was mighty troublesome and a precious waste of time, labor and materials to the workman. At that time such laborious methods were necessary in order to solder efficiently.

Recently a new kind of solder has been placed on the market. It is in the form of a paste in a collapsible tube, put up just like the familiar tube of tooth paste, and all that is necessary for its effective use is to scrape off the surface of the part a little with a knife, squeeze some of the soldering paste on and apply a match, candle or torch. When the paste becomes hot it fuses and solders in the same manner as the old style soldering stick.

The name of this new device is Solder-all, and it is being marketed by the H. W. Johns-Manville Co., through their branch houses in various cities throughout the country. Its convenience, cleanliness, economy and many other advantages have naturally made a wide appeal to householders as well as to plumbers, tinsmiths, electricians, hardware and supply stores and others.

Apco Front Axle Number Plate Holder.

This holds the number plate securely in four corners on the I beam axles. Prevents rattle and is absolutely "mechanically right." The Apco holders are made in two sizes, the large size



Apco Number Plate Holder.

fitting axles from two inches across and smaller; the small for axles one and one-half inches and smaller. Made from bronze and adjustable to any number plate. Price per set, \$1.00. For more information, address the Auto Parts Company, Providence, R. I.

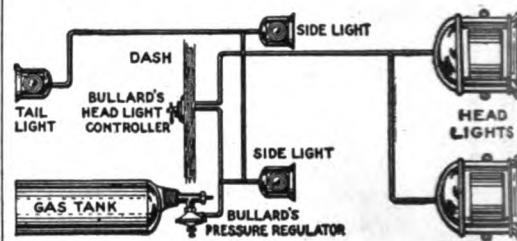
There has been granted to the Ronson Specialty Co., a patent on combination wrenches, fully covering the so-called, "cam-and-sleeve" or "yoke" method of fastening. This in addition to the patent under which is made the Ronson wrench of square shanked wing nut and elongated slot construction. The firm says that no one is authorized to manufacture wrenches under these patents except themselves, and those on the market made by other manufacturers will be dealt with accordingly.

Bullard's High-low Headlight Controller.

Attention is called to a new high-low headlight controller and regulator for automobiles and other vehicles, manufactured by J. H. & E. W. Bullard, Springfield, Mass. These devices have been perfected after years of experiment in gas and other appliances and they were among the very first to apply the principle to the control of automobile head, side, and tail lights.

After much thought and study they abandoned all electric lighting devices where an electric spark is used to ignite the gas as they found it more or less dangerous especially if the electric spark is delayed after the gas is turned on, and have confined themselves to the simple device of igniting the gas with a match or any other well-known means before starting out; and then by simply moving a lever on the controller through a small arc of a circle, located at any convenient point on the dash, floor, or heel-board, the lamps instantly show high or low light as desired, the side and tail lamps being at their maximum at all times. The devices are so perfect

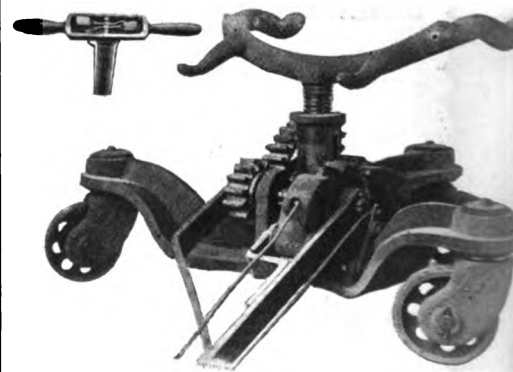
that only one adjustment of the regulator is necessary for all tank pressures from the maximum to the exhaustion of the gas to within four ounces pressure or less. The saving of gas, especially with doctors and others who are obliged to be out at all hours of the night will



soon pay the cost of installation, and the price is so low as to command the attention of all users of automobiles. As an element of safety, especially on country roads it will prevent many accidents where horses are unfamiliar with the blinding headlights. It will pay you to investigate.

A New Auto Jack.

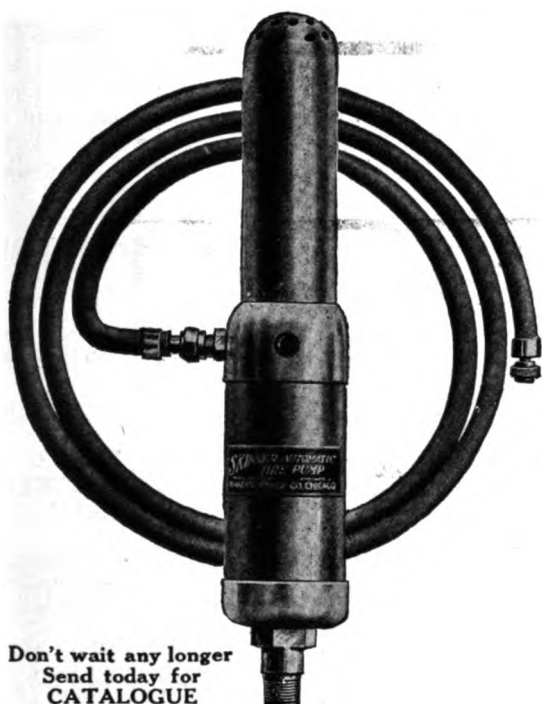
The Canton Foundry & Machine Co., Canton, O., just brought out a universal auto jack which will impress any one seeing it and still more effectively after putting it to practical use. The firm have exercised great care and have taken a long time to perfect this garage equipment, and believe they have it up to that point of excellence where it will fill all requirements and endure for a long time. The short horns of the antlers when the jack is at its lowest point will go under an axle about 10 inches from the floor, and will work under the front axle of the lowest car we have come in contact. When it is desired to use the jack under the rear axle, the stem will run up out of the cylinder on threads to such a height as will leave it under the axle, and then by use of the lever the



Universal Auto Jack.

jack and its load is elevated. All parts of this jack are of the best material possible to obtain on the market. The castor wheels are roller and ball bearing. The greatest weight raised up to the present time has been 3,500 pounds and it required but a very slight effort to do the work. The jack, with its load, is just as easily lowered as it is raised. The raising and lowering ratchets are governed by pawls connected with the handle, and require no effort whatever to release the ratchet when it is understood how to work the jack. The price is low and the company will gladly supply further information by addressing as above.

STOPS THAT PAIN IN THE BACK



Your Motor operates this pump which inflates the tire with **Pure Cold Air**. A universal automatic tire pump which can be easily and quickly attached to any size motor.

The most practical power pump on the market—always ready for service.

Remove a spark plug—Screw pump in its place.

Run engine a few minutes until tire is inflated.

Anyone can use it. **SURE RESULTS.**

The Skinner "Pneu-Flator"

A true air compressor of the "step up" type, pneumatically operated by one cylinder of a four-cycle gasoline engine (not operative on the two-cycle type). Silent and vibrationless, producing volume and pressure sufficient to inflate the largest tire with **pure air**.

It pumps the air you breathe, and does not depend on high speed and a flood of oil to obtain pressure and volume. Its pistons are air-cushioned, automatically checking the length of a stroke, preventing wear or damage when pumping against a deflated tire or when changing hose from one tire to another. The device is absolutely fool proof and non-adjustable.

The price is final. No expense for installation or adapting after purchase of device. Removal of a spark plug and substituting therefor the pump (using the hands only), and disconnecting the ignition of the second plug if dual system is used, is all that is required.

Price \$20.00 each

Pressure Gauge \$3.50 extra

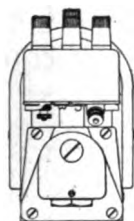
Give name, year and model of car; size spark plug.

SKINNER & SKINNER CO. 1718 MICHIGAN AVENUE CHICAGO, ILL.

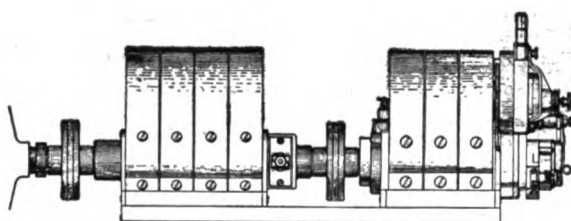
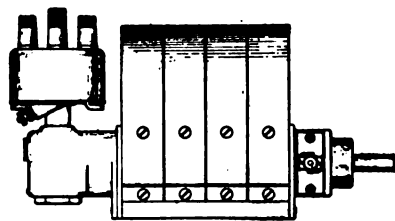
Don't wait any longer
Send today for
CATALOGUE

THE MATCHLESS Electric Lighting and Ignition System

"Fine enough for any car made."



Matchless Generator with complete high tension ignition system.



Matchless Generator with high tension magneto directly attached.

An Electric Lighting System in which we have put a lot of brains and few parts. A Complete Lighting Plant designed by engineers and built by manufacturers. An Equipment which sells and stays sold. If it were an experiment, we wouldn't guarantee it for five years.

We invite correspondence with Dealers, Manufacturers, Owners and Prospective Purchasers of cars.

The Agency for the Matchless System is a Valuable Asset.

CATALOG 1500 D
FOR THE ASKING

THE ESTERLINE COMPANY

Engineers and Manufacturers

LAFAYETTE, - - INDIANA

A POSTAL
CARD WILL DO



THE FOX

TO AUTOMOBILE DEALERS AND REPAIRERS

If you knew positively that by the persistent and judicious use of a typewriter you could in 1911 double your last year's business you wouldn't hesitate an instant in purchasing one!

We have just issued a large illustrated book showing how the big city concerns have built up their immense businesses and shows how anyone in any class of business can increase that business by means of the typewriter. There are hundreds—yes, thousands—of persons in your territory who are interested in Automobiles, and Automobile Supplies and Repairs, and these parties are going to purchase somewhere. Why not send to-day for this book and let me show you how the typewriter will enable you to get this business? **It is Free!**

WRITE FOR BOOK
SHOWING HOW
YOU CAN

Double
Your Sales
WITH A
TYPEWRITER



THE FOX—"THE ONE PERFECT VISIBLE TYPEWRITER"—FOR 20 CENTS A DAY! Sent on **FREE TRIAL** to anyone—anywhere—at my expense—to be returned if not better than the best of other makes. If purchased you can pay me a little down after trial and the balance at the rate of 20 cents a day—no payments on Sundays and Holidays.

The Fox is Visible—you do not have to look beneath a lot of moving typebars to see what is written! It has a Back Space Key, Tabulator, Two Color Ribbon with Automatic Movement, and Removable Spools, Interchangeable Carriages and Platens, Card Holder, Stencil Cutting Device and Variable Line Spacer with Line Lock and Key Release. Its Speed is fast enough for the speediest operator or slow enough for the beginner. It is extremely Durable and almost Noiseless.

Will You Do This Now? I want you to fill out the attached coupon and give me a chance to "show you"—at my expense—what I have. Remember, I belong to no trust—no combination—and no one tells me at what price I must sell nor on what terms I must sell.

SEND FOR MY CATALOG, ANYWAY!

Date.....191.....

W. R. FOX, President, Fox Typewriter Co.,
6606-6616 Front Street, Grand Rapids, Mich.

DEAR SIR:

Please send me a copy of your catalog and write me full particulars concerning your "20 cents a day" payment plan on the new Fox Visible Typewriter. It is distinctly understood that the signing of this coupon does not in any way obligate me to purchase, and that no typewriter is to be sent me unless I decide later to order one for free trial.

Name.....

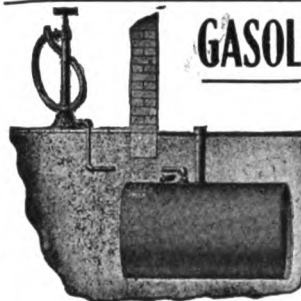
Address.....

Business.....

New Work for Automobiles.

A Los Angeles business man, in moving from old quarters into new, towed his office safe slowly and steadily along several blocks of asphalt pavement, the only difficulty met with being at two lines of car tracks at street intersections. The safe weighs 1,500 lbs.

A California landowner uses his runabout to furnish power for a corn-shelling machine, utilizing a belt attached to the left rear wheel as a means of transmission. A Minnesota farmer uses his machine for numerous farm tasks, among which is the operation of an old-fashioned washing machine. It is noticeable, however, that the automobile only runs the washing machine, and that the owner of the car is himself being utilized to turn the wringer.

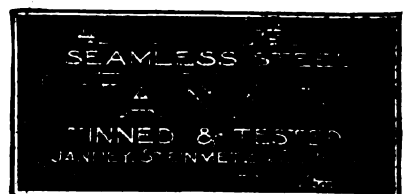


GASOLINE STORAGE OUTFITS

WITH
WELDED-SEAMLESS TANKS
FOR
PUBLIC AND PRIVATE GARAGES

QUICK SELLERS, BIG PROFITS
AGENTS WANTED EVERYWHERE
NEW CATALOGUE READY

LEAKY TANKS ARE
DANGEROUS, SPECIFY
"J. S. CO." TANKS
FOR AUTOMOBILES
TRUCKS AND BOATS
ALL SIZES IN STOCK



RUBBER PUTTY FOR TIRES

*The Greatest Invention of its Class.
A True Money Saver and a Protection to Life and Limb.*



RUBBER PUTTY

Prevents blowouts, avoids sand blisters, saves fabric from decay, keeps out water, causes tires to wear out evenly and smoothly.

Requires no cement, will vulcanize itself, is applied in 5 minutes, does not soil the hands. Saves over \$50 in the season.

Gives safety in speeding.

Send at once for booklet giving further particulars and prices.

THE TOLEDO AUTO DEVICES CO.
709 GARDNER BUILDING, TOLEDO, OHIO

Please mention the Automobile Dealer and Repairer when writing to advertisers.

4 CYLINDER

GETS AT THE HEART OF
THE PUMP QUESTION



IT is a joy to keep your tires inflated if you use the Hawthorne Four Cylinder Pump.

Why ruin your tires by running flat?

It is so easy to pump them up now. You'll save money with the Hawthorne Pump, by making your tires last longer.



Easily attached to running board, and with the six feet of tubing attached any tire can be quickly reached and inflated.

SEND FOR OUR PROPOSITION.

HAWTHORNE MFG. CO., Inc.
7 SPRUCE ST. BRIDGEPORT, CONN.

**HAND
AIR PUMP**



**Schug Ignition and
Lighting Batteries**

are best by every test.

Write us at once for catalog and prices.

SCHUG ELECTRICAL WORKS
Detroit, Mich., U. S. A.

You Cannot Afford to be without a Set of
"MISSIP DETECTORS"
on Your Car.

WRITE FOR CIRCULAR TO
THE CHAMPION SPARK PLUG COMPANY,
615 JEFF AVENUE, TOLEDO, OHIO

Subscribe to the "Automobile Dealer and
Repairer," \$1.00 Per Year.



The Chain Carbon Remover
in operation.

MICHENER CHAIN CARBON REMOVER

The cause of most engine trouble is carbon deposit in the cylinders. The sure signs of it are Fouled Spark Plugs—Loss of Compression—Pounding caused by Pre-ignition.

Here is a device absolutely guaranteed to remove every particle of carbon from the pistons, top and sides of the cylinders, and sold with the distinct understanding that if not satisfactory to you after trying it your money will be returned.

It saves the expense and delay of tearing down the motor—eliminates disturbing the bearings and adjustments difficult to secure again—DOES NOT scratch or nick the metals, which a sharp-edge tool is liable to do by the old "hand scraping" way.

Price 75c. or 3 for \$2.00

Our list of Jobbers and Dealers published in January Journals contained but 15—
Here's a list of over 100, selling this device—must be a reason!

AUGUSTA, GA., Peroux & Jones, Reynolds Street.
ALBIA, IOWA, Reo Garage Co.
BOSTON, Post & Lester Co., Devonshire St.
BOSTON, Equitable Distributing Co., Col. Ave.
BUFFALO, Centaur Motor Co., Franklin St.
BUFFALO, Frey Auto Supply Co., Main St.
BALTIMORE, MD., Auto Supply Co.
BARRE, VT., S. E., Spafford's Garage.
BEATRICE, NEB., Wheaton Automobile Co.
BELLEVILLE, ILL., Modern Garage & Auto Co.
CAMERON, MO., Harper & Pixlee Co.
CHICAGO, Richard S. Morris Co., Dearborn Street.
CHICAGO, Matador Tire & Vul. Co., Michigan Ave.
CEDAR RAPIDS, IOWA, I. M. Dodge.
CINCINNATI, O., Bumiller-Remelin Co.
CINCINNATI, O., Oskamp Auto Supply Co.
CARMEL, N. Y., E. A. Ryder's Garage.
CHARLOTTE, PA., Spencer Auto Garage.
DENVER, Auto Equipment Co., Broadway.
DERBY, CONN., Abbott & Co.
DELAWARE CITY, DEL., Wm. U. Raybold.
DENVER, COL., Denver Auto Goods Co.
DAYTON, OHIO, The Geyer Sales Co.
DAYTON, O., J. G. Warring, 1637 Nat. Ave.
DES MOINES, IOWA, T. S. Provolt, Citizens Bank Building.
DES MOINES, IOWA, Morrison Auto Co.
DES MOINES, IOWA, L. J. Wells Livery Co.
ELMIRA, N. Y., Main St. Garage.
EASTON, ILL., Penewitt & Fager.
ELGIN, ILL., D. M. Todd.
EAST PALESTINE, OHIO, Auto Garage Co.
FORT DODGE, IOWA, Billie Kolb Co.
FARGO, N. DAK., More Bros.
GAMBIER, OHIO, Gambier Garage Co.
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GALVESTON, TEX., John Sealey Garage.
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HAVANA, CUBA, J. H. DeDiaz & Co.
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KINGMAN, IND., Kingman Auto Co.
KALISPELL, MONT., Frank D. Stoop.
KANSAS CITY, Motor Tire & Supply Co.
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LAKE VIEW, IOWA, Lake View Auto Co.

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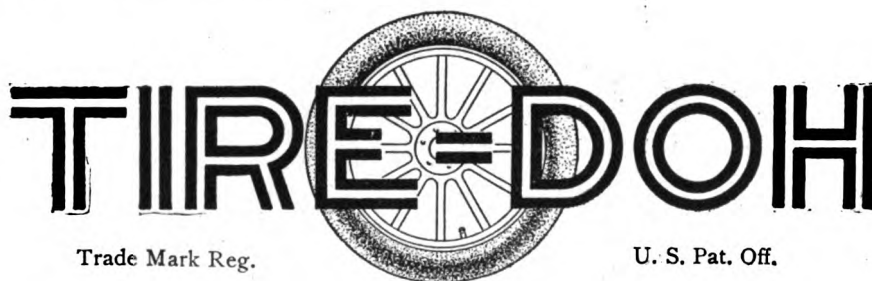
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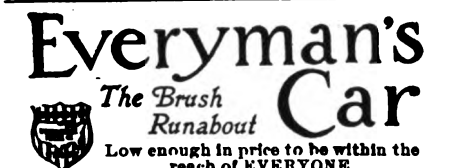


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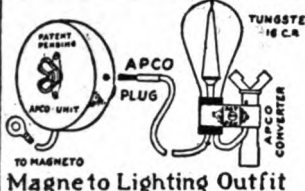
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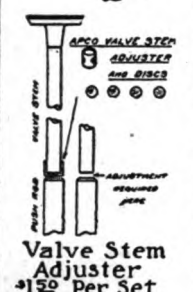
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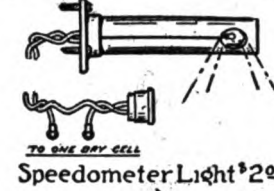
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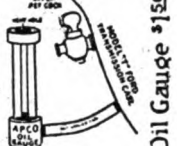
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


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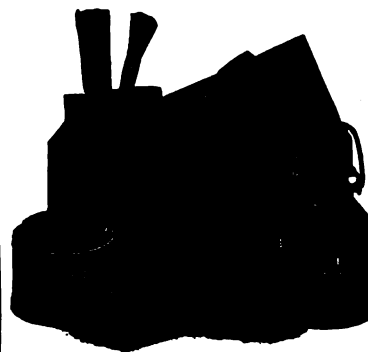
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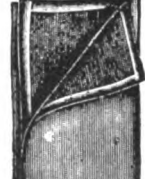
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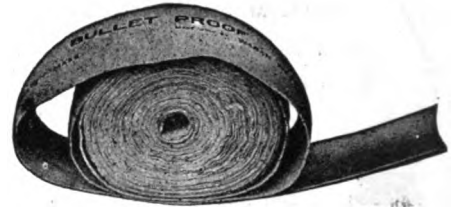
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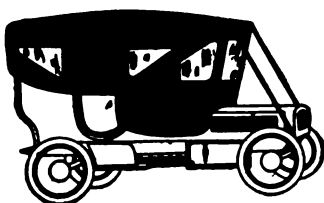
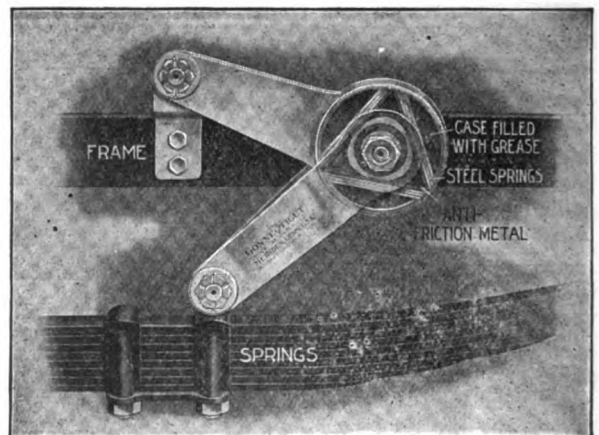
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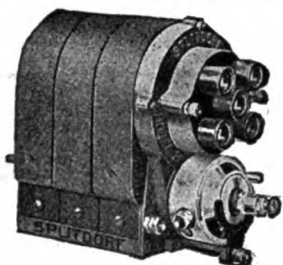
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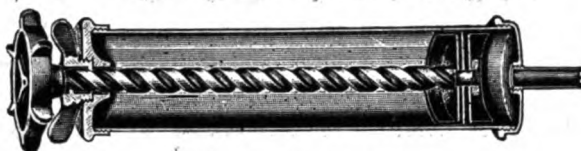
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Air Compressors for Garage Use

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Send for price list on all size Cases, Tubes and Reliners. On receipt of 10¢ I ship, allow examination. Many have re-ordered. If you order a Tube or Reliner and want it sent to you by mail, send Post Office Order for total amount.

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9' swing
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For Repair Work our No. 13 Lathe is right; has 13' swing, auto cross feed, length of beds from 5 to 10 feet long; furnished with counter-shaft or foot-power.

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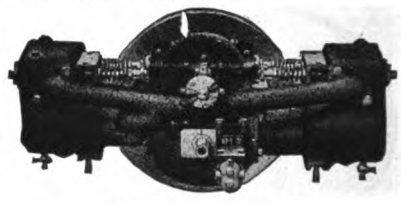
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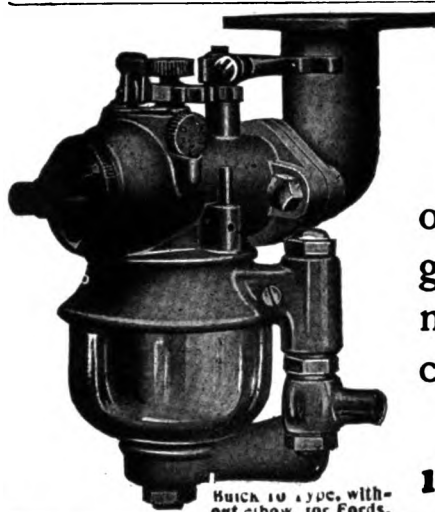
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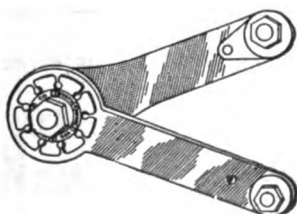
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You must realize that the extra pressure these jolts throw on your tires weakens them till they blow out. You must realize that the constant vibration shortens the life of your engine.

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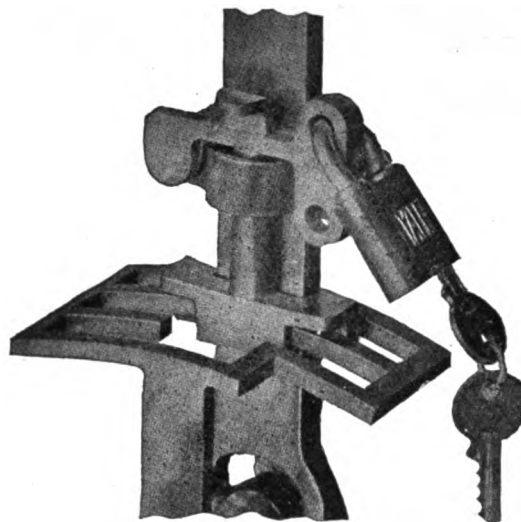
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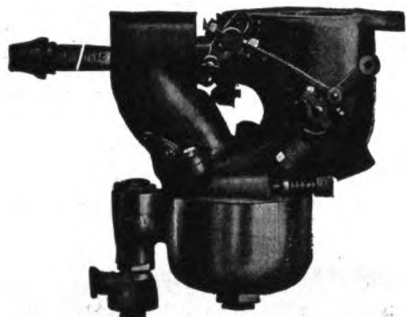
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\$3.50 provides the necessary insurance against thieves for the life of your car. In ordering, send name, model and gear of car, and we will send you a lock with a positive guarantee of satisfaction or money refunded.

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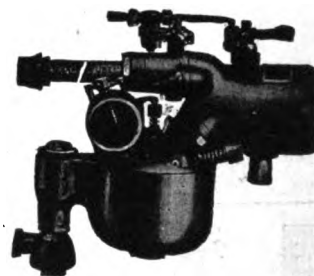
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Results:—Flexibility—greater than dreamed of, and saving fuel too.

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give the purchaser the maximum of style, power and satisfaction for the money invested. Engineering skill of the highest order, ample capital, modern factory facilities and a willingness to sell on a modest margin of profit, make Cutting Cars at Cutting prices possible.

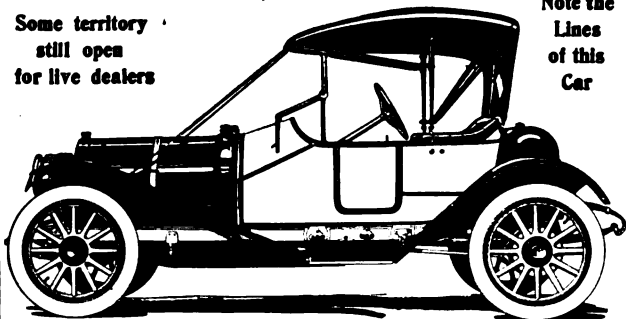
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Because, as you can see when you pour out this oil, it has a surpassing lubricating richness.

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The Goodyear Rim Cut Patch solves the problem of an emergency repair in a hurry. A rim cut cannot bother the motorist who carries Goodyear Rim Cut Patches.

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THIS OIL GAUGE CONSTRUCTED OF BRONZE IS
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Hooks in clinch of rim.
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Tires are built to withstand a CERTAIN pressure, No more—no less.

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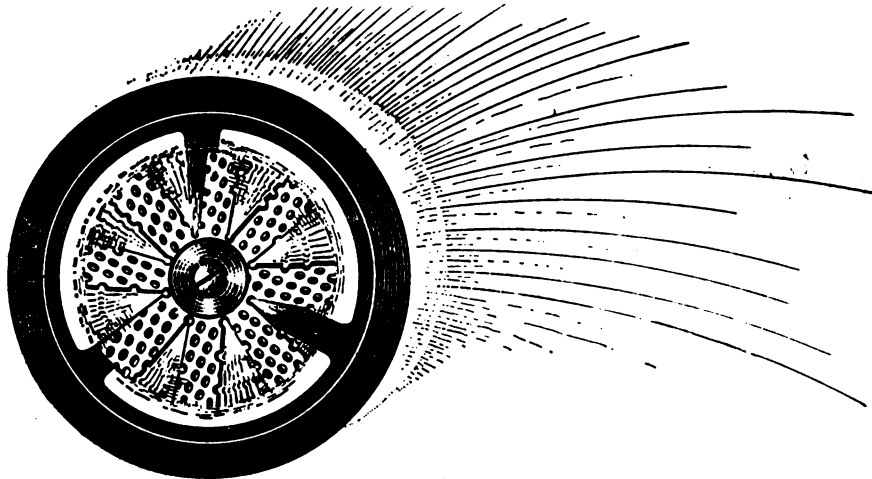
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You cannot buy better spark plugs or timers than a MONARCH. Others sell for a great deal more money and these do not represent near the quality that MONARCH Spark Plugs and Timers do.

We offer you the very best that can be manufactured for the least money. A sample order will convince you.

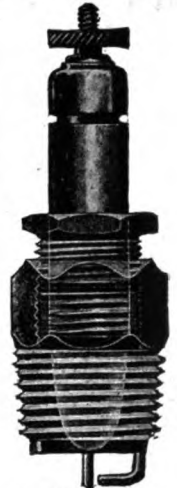
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For Reliability Cannot be Beat. Guaranteed for one year.

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SPECIAL SHORT SHAFT TIMERS FOR FORD, BUICK AND MAXWELL CARS.

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A THREE TO ONE PROPOSITION

And still demand increases—a logical outcome of the placing upon the market a chain that will positively be "on the job" after three ordinary chains are in the scrap pile.

We have proved it—thousands of Atlas chains now in use are proving it—you can prove it if you will.

IS FURTHER ECONOMY AN OBJECT?

If so, bear in mind that the original (and only sane) construction of the inner surfaces of Atlas Chain cross members makes them absolutely harmless to tires, no matter how roughly you use your car.

Those who use this anti-skidding device are therefore—

Buying one set of chains while others are buying three—

Saving chain wear on tires when others are injuring the same at every revolution of the wheel.

The price being about one dollar higher than that of ordinary chains, what then will Atlas Chains be worth to you.

We have an interesting proposition for the dealer—send for it.

ATLAS CHAIN CO.

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A. S. B.

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SPECIAL

Introductory Price
—to—

Automobile Owners

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We are going to make this Special Price in order to get a car equipped with our Treads. We want to prove to the car owners that the A. S. B. Tread is the only mechanically perfect Tread on the market. That is all we ask. Get the first car equipped with our Protectors. The Treads will do the talking then and will get the repeat orders.

The A. S. B. Tire Protector is the only Tread on the market that has a self-adjustable spring fastener. This attachment actually prevents excessive creeping. Guaranteed to not heat, chafe nor injure your tires by creeping. It is absolutely puncture proof, and non-creep as well as non-skid. It is air-cooled. A tire equipped with an A. S. B. Tire Protector runs cooler than without one.

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It seems simple enough to melt the edges of a crack together by means the Electric Arc or the high temperature Oxy-Acetylene Flame.

BUT

We as Engineers have spent almost four years studying and experimenting.

The welding is simple enough, but the weld must contract, and unless the cylinder or crank case has received just the proper treatment it will be warped or there will be shrinkage strains that may break it again in the future.

THEN WHY

Will you send your expensive automobile parts to some welding company whose only virtue is that its founders have had money enough to buy a welding plant?

The cost of the best welding plant is not 1/10th of what we have spent on experimental work.

We have built our business by satisfying every customer; moderate prices, good workmanship, promptness in delivery, and a guarantee that never ends.

We Solicit Your Patronage.

Sales Agents for the
Best and Simplest
Welding Plants.

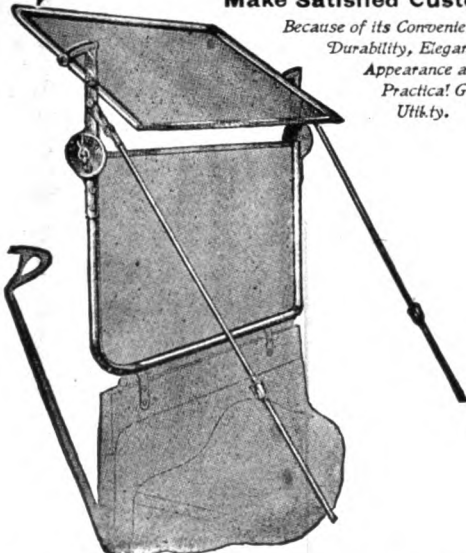
THE J. H. DEPPERER CO., Inc.
JERSEY CITY, N. J.

VASCO

WIND SHIELDS

Make Satisfied Customers

*Because of its Convenience,
Durability, Elegance of
Appearance and
Practical General
Utility.*



Position for rain, snow and sleet. You see the road between the sashes.

DEALERS AND AGENTS

The demand for "VASCO" Shields has been established and is increasing rapidly, owing to the extensive advertising campaigns which have been inaugurated and the unprecedented values offered. Prices have been reduced to the lowest possible basis consistent with superior construction and material. Our agency proposition is exceptional. Write for it now, as your territory may still be unallotted, and we want you to participate with our other dealers in the business resulting from our campaign. Do not delay but write to-day.

VICTOR AUTO SUPPLY MANUFACTURING CO., 35 West 43d Street, New York City

USE



SELL

MAKES YOUR OLD CARS LOOK LIKE NEW OVER NIGHT.

Add a profitable and necessary department to your garage, with no other investment than a small supply of AUTOLAC.

WHAT IS IT?

AUTOLAC is easily applied by anyone.
AUTOLAC is a smooth, brilliant finish.
AUTOLAC is durable. Will not discolor.
AUTOLAC dries over night.
AUTOLAC needs no rubbing or polishing.
AUTOLAC makes your old cars look new.
AUTOLAC can be used on any color.
AUTOLAC preserves the finish.
AUTOLAC will make money for you.
AUTOLAC is sold under a guarantee.

Gallons, \$5.00; Halves, \$2.75; Quarts, \$1.50; Pints, \$1.00.
Prepaid when Cash accompanies order.

Write for discounts and descriptive matter.

Every Garage should know of our

"AND YOU MAKE 200%."

For Sale by all Live Jobbers and
Distributed by

Frey Auto Supply Co., 700 Main St., Buffalo.

Polish Specialty Co., 83 Park Place, Detroit.

John F. Revalk, 518 Van Ness Ave., San Francisco.

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The Beckley-Ralston Co., Chicago, Ill., (wholesale only.)

Motor Tire & Supply Co.

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Chas. E. Miller, New York, Brooklyn, Boston, Hartford,
Springfield, Philadelphia, Atlanta, New Orleans,
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AUTOLAC MFG. CO., 916 HURON ROAD,
CLEVELAND, OHIO.

AUTOLAC MFG. CO., Cleveland, O.

GENTLEMEN: - For the enclosed \$ send me 1, ½, ¼
gallon of AUTOLAC, charges prepaid, under the condition that
money will be refunded on request.

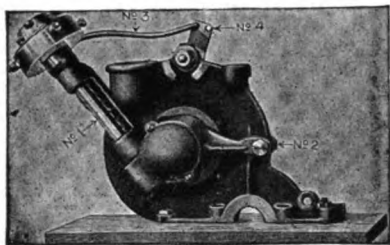
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CITY

DEALER

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Ford Car Elevated Timer

Places the timer in an accessible position for proper care and repairs. Can be installed in 30 minutes.

Write for Circular.

Discount to the trade.

SPENGLER OPTICAL CO., Geneva, N. Y.



You "Auto"
Try It.

TRIUMPH LEATHER VARNISH

WE GUARANTEE IT.

Saves Auto Seats
and Tops.

For the past few years there has been a growing desire among Auto Dealers, Garage Owners, and Automobile Users throughout the country to find something in the form of a varnish to replenish Auto Seats and Tops and keep them in neat and apparently new condition.

Every Automobile user knows that when the seats and top of his Automobile look shabby and worn, that it gives the entire machine an old, "out of date" appearance, no matter how good the mechanism of his machine may be.

We are therefore desirous of informing you that after several years of careful study we have succeeded in obtaining the ingredients with which we manufacture a varnish that will renew the appearance of your Auto seats and top, give them that new, high natural finish, prevent rain and water from eating into the leather, which causes it to crack and blister.

Our Triumph Leather Varnish when applied to leather will be dry in 15 minutes, and will not be sticky or tacky but will be perfectly dry, at the same time keeping the leather flexible, soft and durable.

Triumph Leather Varnish is indispensable to every Auto Owner. Ask Your Auto Supply Man. If he cannot supply you, send us his name and address, and we will send you a can on approval, Express Charges Prepaid. If you are perfectly satisfied in every particular, send us \$2.25 for a quart can, or \$1.25 for a pint can; if not, send back the can. When ordering, please mention color desired: black, tan, brown, maroon, or green.

Manufactured only by the

NOVUS-HOMO MFG. CO., 1340 Fond du Lac Ave., Milwaukee, Wis.



**SAFETY
SERVICE
SATISFACTION
10,000 Miles**

The tire that will do this is the King. Here it is in a nutshell. It has all the merits of the best rubber tire—it hasn't one of the rubber tire defects. Acknowledged to be the ideal touring tire. It is something different—in a class by itself.

We guarantee from 5,000 to 10,000 miles, according to size, and against rim-cuts, punctures and blow-outs. Our special armor cover of steel studs prevents skidding.

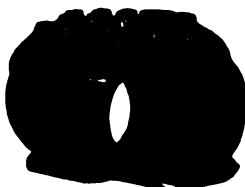
Write for literature if you are interested.

We make complete tires—not covers.

King Leather Tire Co.

3446 Vliet Street

Milwaukee, Wis.



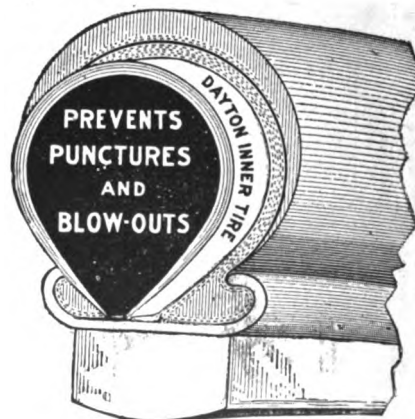
HAD ANY PUNCTURES TO-DAY?

Users of the

DAYTON INNER TIRE

are free from the annoyance caused by punctures and blow-outs.

When the DAYTON INNER TIRE is inserted, those troubles simply cannot occur,—even with treads completely worn off the tires.



They're inexpensive—easily inserted and removed. You should use them and put an end to tire trouble.

If your dealer does not have them, write for a descriptive price list today.

DAYTON INNER TIRE & MFG. CO.,

19 Madison Street,

DAYTON, O.

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Twenty Dollars More a Day—Easy

IT'S about a 10 to 1 shot that you are one of the 5,000 and more users of the Type B Shaler Vulcanizer. You know what it is doing for you.

Makes vulcanizing worth while, doesn't it?

This Type C

SHALER

Vulcanizer

is even a better money-maker than Type B. It handles the big blow-outs that you may have thought could only be repaired by some expensive, unwieldy apparatus that would take up more room in your shop than it was worth. Type C takes only a couple of feet of bench room. It brings the profits in bunches. Any boy who can wash a car can do the work, and rarely does a blow-out repair bring in less than \$5.00—mostly profit.

You can make four or five such repairs in a day. There's very little work to it. Instead of cutting away a lot of rubber from the tread and tediously building it up again you simply cement a few layers of fabric on the inside of the tire, clap it on the heater, fill up the cut on the outside with Para gum, put on your Type B and let it cure. Type C applies the heat to the inside, your Type B to the outside, welding the new material into place under an enormous pressure.

Such a repair is stronger than the rest of the tire. *You can guarantee it* In order to give out, the patch on the inside would have to be blown right through the casing; practically a physical impossibility.

Are you interested? Too bad we can't tell all about Type C on this page.

Garage Booklet Free. We are just preparing a new edition of the booklet "Common Sense About Tire Repairs." It will be worth your while to tear off this coupon and mail it to us to-day. We hope we have ordered enough copies to go around, but it is going to be a case of "first come, first served."

C. A. SHALER CO., 806 4th St., Waupun, Wis., U. S. A.

Please send me a free copy of the famous garage handbook, "Common Sense about Tire Repairs."

Name.....

Address.....

Our lighting current is

Direct ☐

Alternating ☐

No Current ☐

MILLER'S VULCANIZERS AND TIRE RELINERS.

First quality Imperial Clincher. Dunlop 5 per cent. higher.
Nearly all standard makes of tires at dealers' lowest prices.

Net Trade Prices.

Inches	Each	Inches	Each	Inches	Each
28x2½	\$2.20	36x3½	\$3.80	34x4½	\$5.60
28x3	2.75	30x4	4.30	35x4½	5.70
30x3	2.85	31x4	4.40	36x4½	5.80
32x3	2.95	32x4	4.50	37x4½	5.95
28x3½	3.30	33x4	4.60	38x4½	6.05
30x3½	3.40	34x4	4.75	34x5	6.30
31x3½	3.45	35x4	4.85	35x5	6.45
32x3½	3.50	36x4	4.95	36x5	6.60
34x3½	3.65	40x4	5.55	37x5	6.75
		32x4½	5.50	38x5	6.80

TERMS—Cash with order; money refunded on receipt of goods if not satisfactory. If interested in vulcanizers and rubber specialties, write for our 28-page catalog. We also do tire repairing.



If you want liners made of 14-oz. cloth instead of 19-oz. you may deduct 20 per cent from these prices. If interested in bicycle or automobile tires, either first or second quality or second hand, write for prices.

Miller's Tire Reliners.

Are made of three and four ply 19 ounce tire fabric, vulcanized in shape to lay on the inside of the casing, extended clear around to strengthen same. Can either be cemented in or laid in loose and makes the tire difficult to puncture, also reinforces weak casings. Packed neatly one in a box.



Miller's Circular Lock Patch.

Is made of heavy tire cloth vulcanized to encircle the inner tube and formed to the natural shape of the inside of a tire. By encircling the inner tube you get much greater efficiency than it is possible to get by laying the patch over a hole in the casing. You can also use this patch for a rim cut as there is a thin edge which can be brought around under the tire, giving great strength at this point.

PRICES.

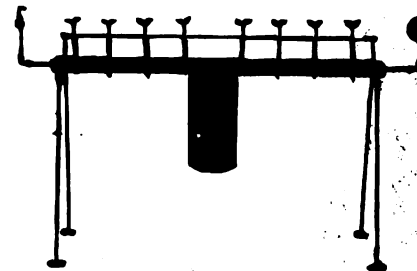
2½ inches, each \$0.78 | 3½ inches, each \$1.08 | 4½ inches, each \$1.38
3 " " " .90 | 4 " " " 1.20 | 5 " " " 1.50

Miller's Inner Tube Patches and Valve Seats.

Made of good grade rubber and in all sizes. Where extra large quantities are ordered can put the customer's name on patch.

Price, \$2.50 per Pound.

Miller's Inner Tube Vulcanizer.



Has a tube plate 54 in. long and 4 in. wide with plain surface highly polished, complete with stand, 13 fine boiler, gas burner, water glass, pop valve, steam gauge, 8 clamps and two molds for curing the treads of casings, price \$25.00; gasoline burner \$2.50 extra. Tube plate only with steam

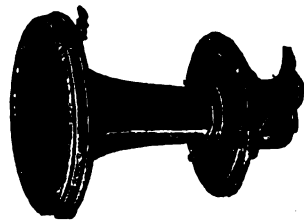
gauge and 6 clamps, price \$10.00.

We also manufacture various other vulcanizers. No. 1 and No. 2 adjustable sectional vulcanizers, complete with boiler, \$35.00 each. Bicycle vulcanizers, \$7.50; Motor cycle vulcanizers, \$12.50; Tread Rollers, \$12.00; Kettles, \$115.00; Power wrapping machines, \$175.00 each. We do all kinds of tire repairing and carry a large stock of tires at reasonable prices. If further interested in vulcanizers

Write for Catalog and Special Proposition.

CHARLES E. MILLER. Anderson, Ind.

NEW ELEKTRON AUTO HORN



This new Elektron Horn was designed to meet the demand for an attractive, durable and effective Auto Horn. The tone is of a clear, clarion type, sharp and penetrating, BUT, NOT HARSH. We have placed the price within reach of all and at the same time produced a first-class horn in every respect. Operated on four or five dry or six volt storage.

Sold at low price. We can surely interest you. Write now for price and particulars. We have many other styles of horns. Get our printed matter.

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Still the Only Advanced
Car in Three Years.

HUDSON "33"

HUDSON MOTOR CAR COMPANY
7018 Jefferson Ave. Detroit, Mich.

FIBRE

Sheets, Rods, Tubes and Special
Shapes for Automobile Work

H. M. GRANT

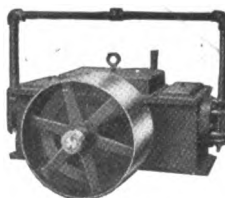
6 Murray Street, New York

"IF IT'S METAL WE MEND IT"
SPRINGFIELD BRAZING CO.

EXPERT BRAZERS OF CAST IRON, MALLEABLE IRON,
COPPER, ALUMINUM, BRASS, STEEL

Don't scrap your broken castings, large or small,
any shape, we will make them stronger
than originally at small expense.

12 WILLOW STREET, - SPRINGFIELD, MASS.
Cor. Stockbridge St. Telephone Connection.



Garage Air Compressors

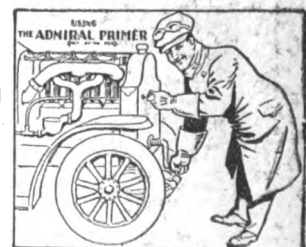
Several sizes and styles
especially for garage
work.

Simple and reliable.
Hundreds in use.

GEO. S. COMSTOCK,
Mechanicsburg, Pa.

THE ADMIRAL PRIMER

(Patent applied for.)



This Instantaneous
Engine Starter
should be on
every car.

Every car
owner should
have one and
every dealer
and repairman
should carry
them in stock.

Write at once
for descriptive
circular, giving
full particulars
and price.

Special Terms to Dealers.

Address. ADMIRAL MFG. CO., 715 India Ave., Kansas City, Mo.

Price, \$385 **MOTORETTE**



C. W. KELSLEY MFG. CO.

As well built as a
\$6,000 automobile.
Send for Catalog B.
Dealers wanted.
Guaranteed for one year.
HARTFORD, CONN., U. S. A.

SCHACHT CARS.

All the strength, durability, speed and beauty of
high priced cars for \$1385.00

Write for Catalogue.

SCHACHT MOTOR CAR CO.
2757 Spring Grove Ave., Cincinnati, Ohio.



MONOGRAMS

Is your car exactly
the same as hun-
dreds of other cars
of the same make?
What marks your
car as your own
property? A Mono-
gram will give it a
mark of distinction
and refinement.

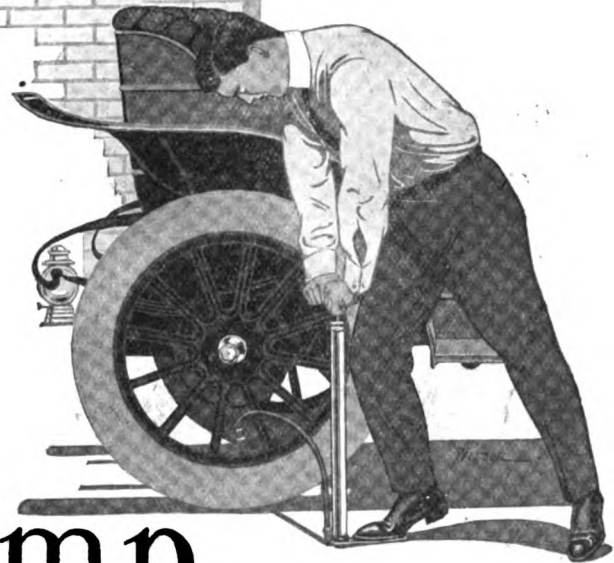
Hickok Mono-
grams are the best

and our prices are low. Write for special propo-
sition and booklet B today, now.
THE HICKOK MFG. CO. 44 St. Paul St., Rochester, N. Y.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Every
Effort
Counts
with a

Pitner Pump



—but not with any other pump. This is why: to pump a tire with *least effort* you *must finish* the stroke—hard. If the piston is going to “strike bottom” you’ll shirk. *Instinctively* you avoid the jar—and thereby *lose* a large part of your previous effort.

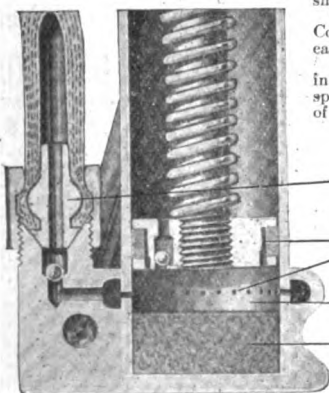
With a Pitner Pump you *can't* “hit bottom.” You can put on *all* your weight at the *end* of the stroke where it *counts most*—then you strike the *air cushion*. Not a particle of jar to you or the pump—long life to both of you.

The air cushion explained below is only *one* of many *exclusive* features that make the Pitner Pump the *only means* of in-

flating tires that is *always dependable* any time and any place. Also it is the only tire pump *guaranteed* for five years' service—a new one *free*, if yours fails to satisfy *you* any time within five years after purchase. That's *our* guaranty, stamped on the name plate of every pump.

Some day on the road you may pay dearly, in tires, for *want* of a dependable pump—unless you clip the coupon below as a *reminder* to see your dealer about the Pitner Pump. For *quick action* telephone him now. Then if he *can't* supply you, send us his name and \$5 and *we* will ship you a Pitner Pump, *express prepaid*. Money back, if you ask it. So

Note the Exclusive Features



This vertical section through the center of the base of the Pitner Pump shows all working parts.

C—the famous Can't-Pull-Off-Hose Connection, strongest known and easiest to attach.

R—the Leather Piston Ring fitting in a groove around piston. Note air space around ring, open to lower side of piston. The harder you pump the tighter this Leather Piston Ring is pressed against pump barrel, making it an almost perfectly air-tight piston.

O—openings for air to pass to hose and tire. As soon as the piston passes these holes no more air can escape, and thus at

A—a small Air Cushion is formed, just enough to make it impossible for piston to strike bottom with a jar.

F—the felt pad below air cushion which absorbs surplus oil and thus keeps it out of your tires.

Pitner Pump Co., 1214 Michigan Ave., Chicago.

Clip this coupon NOW

Pitner Pump Co., 1214 Michigan Ave., Chicago

Gentlemen:—My dealer whose name and address are

Dealer's

Name.....

Dealer's

Address.....

says he is not prepared to deliver me a Pitner Pump.

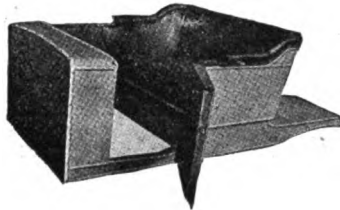
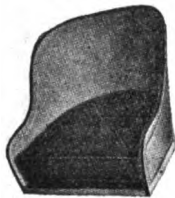
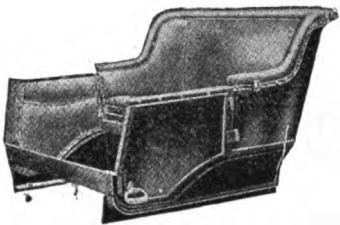
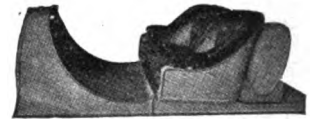
For the enclosed \$5.00 { draft } { check } { money order } please ship me one

express prepaid upon condition that you will return my money in full if pump is returned to you within 15 days from this date.

My Name.....

My Address.....

If before ordering you want our interesting *free* booklet that explains *all* pumps, just send us this coupon *without* the \$5.00.

SEATS, \$10.00 to \$35.00**FENDERS, \$10.00 to \$20.00****TOPS****WIND SHIELDS****AMMETERS****LAMPS****TANKS****FENDERS****LEATHER
GOODS****HOODS****DASH SHROUDS****SEATS AND BODIES FOR ANY CAR**

Special Seats for the Maxwell, Ford, Rco, Brush, Buick, Hudson, Flanders and others. When writing mention name and model of your car.

GRAND HAVEN AUTO BODY CO.

Grand Haven, Mich.



THIS little book was written especially for beginners. Either the man who uses an engine for pleasure or profit, but who has not time to study a technical book.

It gives full details in connection with running gasoline engines, stated in simple language that anybody can comprehend. It contains numerous illustrations.

A copy will be sent you on receipt of the price, 25 cents, in postage stamps.

M. T. Richardson Co.,

27 Park Place,

NEW YORK CITY.

TIRE BARGAINS

We invite a visit to our Newly Opened Salesrooms at
1708 BROADWAY

Where we offer both
"FIRSTS" AND "SECONDS"
Of various well-known makes at extremely low prices.

Absolutely New 1911 Imperial Tires
CLINCHER, UNIVERSAL and DUNLOP

28x3.....	\$9.75	32x4.....	\$16.75
30x3.....	10.25	33x4.....	17.50
32x3.....	10.50	34x4.....	18.50
30x3½.....	13.50	35x4.....	18.75
32x3½.....	14.50	36x4.....	19.50
34x3½.....	14.75	34x4½.....	23.50
30x4.....	16.25	35x4½.....	24.50
31x4.....	16.50	36x4½.....	25.50
		37x4½.....	26.00

STERLING TIRES

Not many left just now but if any of the following fit you, then here's your opportunity for a real bargain in this superior make of tire.

32x3.....	\$11.00
34x3½.....	15.75
32x4.....	17.75
34x4.....	21.00
36x4.....	21.50
32x4½.....	18.50
34x4½.....	25.75
36x4½.....	26.50

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(Samples on Request.)

28x3.....	\$2.75
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32x3½.....	3.85
34x3½.....	3.95
30x4.....	4.00
31x4.....	4.20
32x4.....	4.40
33x4.....	4.65
34x4.....	4.75
36x4.....	4.90
34x4½.....	5.20
36x4½.....	5.45

TIMES SQUARE AUTO CO.

1710-12-16-18 BROADWAY

Near 54th St.

Telephone, 7366 Columbus

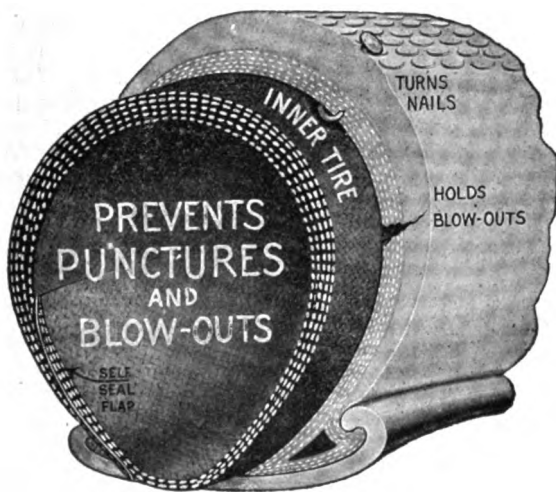
Please mention the Automobile Dealer and Repairer when writing to advertisers.

Mr. Dealer, Get the Agency For this Live Proposition!

There are more Inner Tires and re-inforcements sold this year than ever before. A big demand already exists for our Interlock Inner Tire, and YOU should be in position to supply this demand. The reason is plain, and easily understood. Every automobile owner WANTS to get the maximum service from his tires and eliminate punctures and blowouts. Below we give you a brief description of what the Interlock Inner Tire will accomplish and then let you judge for yourself whether you want to take on this line in your territory.

INTERLOCK INNER TIRES

"Insure the Most Miles at Least Expense."



1st. When placed in new or practically sound tires it gives double-strength, as it is made as heavy as the fabric body of the tire itself.

2nd. Being cement coated, it adheres to the inner walls of the casing, and prevents creeping or doubling up.

3rd. In old casings, it covers up the fabric breaks or cracks

in the tire, thus renewing the strength of the casing, and preventing tube pinches.

4th. It adds ALL the STRENGTH of the RE-INFORCEMENT to ALL the strength of the CASING. When the casing is no longer serviceable the "Interlock" can be removed and used in another tire. Therefore, the cheapest miles that can be obtained from a casing are those which the Interlock will add to it.

5th. It is NOT an inner shoe, or reliner, but an INNER TIRE, completely envelops the tube, gives a RE-INFORCEMENT to the sides of a casing, as well as the tread, a feature not found on any other inside re-inforcement.

We want every automobile owner to receive free, one of our illustrated booklets, "Tire Troubles and Expense," which will be mailed promptly if you will write for it to-day. We will mail small sample to every owner giving us the name of dealer and tire repair man.

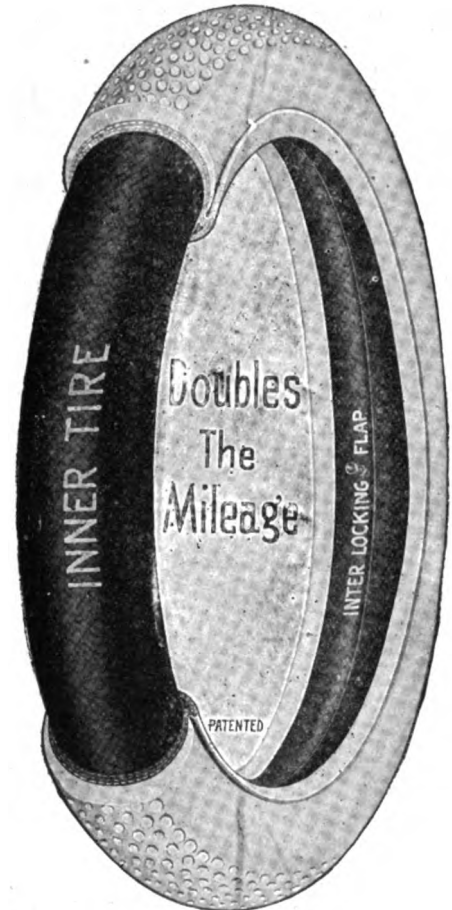
ADDRESS THE

DOUBLE-FABRIC TIRE CO.,

18 E. 7th STREET,

AUBURN,

INDIANA.



**Mail
this Coupon
to us To-day.**

Double-Fabric Tire Co.
18 E. 7th St., Auburn, Ind.

Please send me your Free Booklet, "Tire Troubles and Expense."

Also Prices for.....

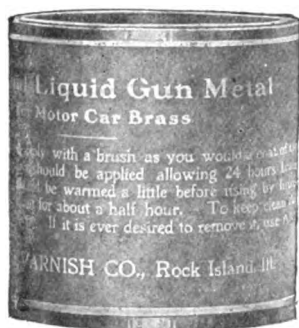
.....Tires.

NAME.....

ADDRESS.....

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TIRED OF POLISHING BRASS?



With Arsenal Liquid Gun Metal on your lamps and radiator you have no polishing to do. It is applied with a brush the same as paint or varnish and makes a lasting gun-metal enamel on all brass parts. Can be removed at any time without injury to the brass. Have you ever seen a steel blue revolver? Well, that is the color of Liquid Gun Metal. Used and endorsed by thousands of motorists. If not at your dealer's \$1 brings a can express prepaid. Liquid Gun Metal is the standard material for enameling motor car brass. Don't pay a painter \$75 to paint your car. Do it yourself with the Arsenal system. Ask us how.

ARSENAL VARNISH CO., 2501 4th Ave., Rock Island, Ill.

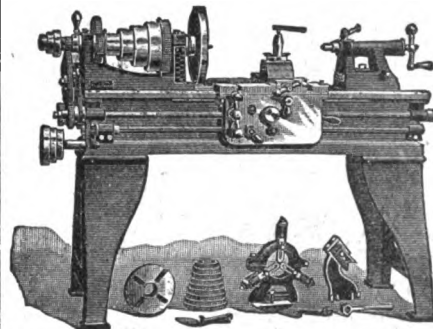
The POSITIVE Lock Washer

Made in all sizes and weights for Automobile purposes. Can be used thinner than any other lock washer—effective, no matter how thin. One lock under the nut and head can be used if so desired. Exhaustive tests, covering a period of nearly 18 years on railroad track, drop presses, Automobiles and machinery subject to vibration, have proven its superiority over every nut lock manufactured. Write for samples and price. Made exclusively by the

POSITIVE LOCK WASHER CO., Newark, N. J.

All others are imitations.

LATHES LATHES LATHES



We have built nothing but lathes for the past twenty years and surely by this time we ought to turn out a thoroughly first-class tool, and there is no doubt about it, we do. Our 15 inch *Lathe* is a very popular tool in *Garages, Automobile and General Repair Shops.*

WILL YOU NOT WRITE US FOR A COPY OF OUR CATALOGUE AND A PRICE ON ONE OF THESE LATHES?

THE SEBASTIAN LATHE COMPANY, 108-110 CULVERT STREET, CINCINNATI, O.

GASOLINE STORAGE UNDERGROUND OUTFITS

\$12.50, \$25.00, \$35.00 and up.

GOOD GOODS. LOW PRICES.

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Oily Waste Cans, meeting insurance requirements. Accurate Measures, and good funnels.

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Every Garage needs one. Write for Catalog R. T., a postal will bring it, it tells all about turntables.

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will be found in the latest Illustrated Catalogue of the National Auto Supply Co., Dept. "B," 77 Chambers St., New York City. Write for it.



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The brake lining that grips. Has long life and unequalled friction qualities. It gives the greatest efficiency and service.

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—FROM PREMIUM PENNSYLVANIA CRUDE—

And Keep Engine Free From Carbon, Smooth-Running and Powerful. We Pay Freight To Try At Our Risk. Send for Special Offer, Sample and Booklet (A) telling how oils are made and tested. **ENDURANCE AUTOIL CO., Muncie, Ind.**

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Dealers should write at once for special proposition on our tires, which are covered with a chrome tanned leather outside jacket requiring a pressure of over 4,000 pounds to puncture it.

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Absolutely Automatic.

This shield operates with more ease than any other.

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STOP TIRE EXPENSE

8 to 14 Hours a Day Your Car is at Rest

Weight of car is wearing out tires as much as running. You can save this wear with **Moore Tire Saving Jacks.** 30 seconds night and morning jacks up or lets down heaviest car. Boy or woman can do it easily. One jack for each wheel; ring slips over hub, see cut, fit any car. Price, per set of four, \$6.50, carrying charges paid. Address **J. C. Moore & Co., 306 Wisconsin St., Racine, Wis.**

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LIGHT in WEIGHT and LOW in COST.

The Center-Studded Woodworth Tread is a new type similar to the regular full-studded Tread except that it is made of a little lighter leather and is not studded with rivets on the sides. Except for use on very rough, or rutty roads, that wear or injure the sides of the tires, the Center-Studded Treads are as good as can be produced. The special treatment of the leather which is used on all Woodworth Treads makes the leather so tough and durable that it will outwear the rivets. The rivets used on the middle of the Center-Studded Treads are the same as the higher priced full studded style.

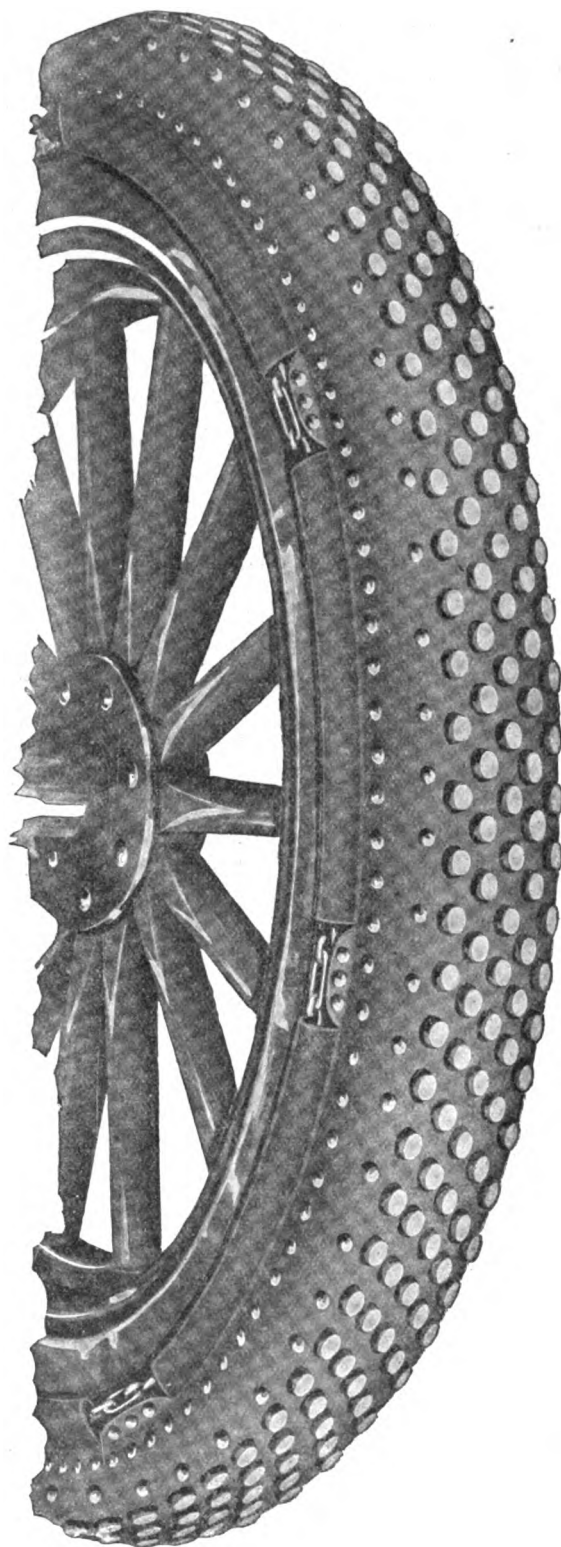
The Center-Studded Treads will stand as much wear on the sides as the ordinary rubber tires, so that for many automobile users they will give as good service as the full-studded Treads and they have the advantage of being lighter in weight and lower in price.

The Center-Studded Woodworth Treads have our latest Quick Adjusted fastening which we shall use for 1912. They are guaranteed not only to give good wear but not to injure the tires in any way.

All Woodworth Treads have the coil-spring adjustment, which absolutely prevents looseness which causes chafing and heating of the tires with other makes of protectors.

Send for description and prices of Woodworth Treads and free booklet "Preservation of Tires."

Leather Tire Goods Company
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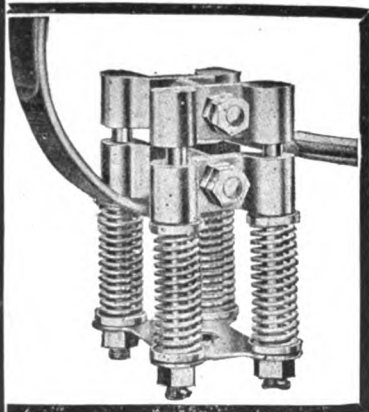
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WHY NOT

Make your car ride as easily as a Velvet Cushion ALL THE TIME. Velvet Springs make rough roads smooth, and absorb the jolty, irritating, jiggly motion, caused by cobble stones and rough roads and by stiff auto springs, or springs which are too resilient.



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In writing give name of car;—weight;—width of spring;—and size of spring bolts.

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You can send remittance, use for 15 days, and if not satisfactory, return and get your money. WRITE NOW for prices.

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"Evernew" Auto-Top
Dressing will brighten
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like new

IT will make it weather-proof, water-proof, sun-proof and last longer. You can do all this quickly and inexpensively with a supply of

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Every can backed by a half century's experience in producing a dressing that is easy to apply, dries quickly and won't crack afterwards. Comes in 8 standard colors—special shades to order.

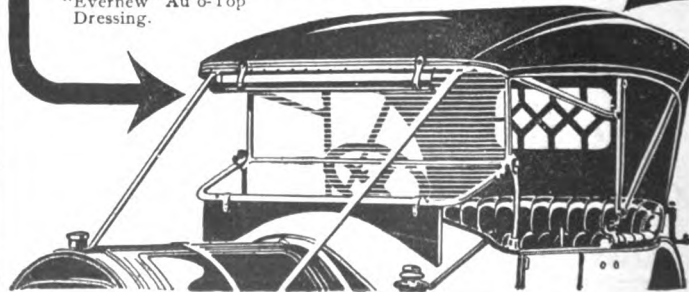
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Yes!—I mean every word I say, when I guarantee you 10,000 miles service on every 1911 "BRICTSON" Heavy Car Type Tread, and I will positively make good my guarantee. I have been studying this tread proposition for the last six years and have devoted the best of my life in perfecting this wonderful tread. Yes! Wonderful, that is just what I mean and I am not afraid to look you square in the face when I say it.

Mr. Motorist, you cannot afford as a matter of economy, to run your car without using the 1911 "BRICTSON" Detachable Heavy Car Type Tread, when I am offering you a guarantee of

10,000 MILES

WRITE FOR A COPY OF MY GUARANTEE

Let me prove it to you by the hundreds of letters in our files from satisfied customers that are just as enthusiastic over BRICTSON DETACHABLE TREADS as I am. While dictating this advertisement to my Edison Business Phonograph, a letter from one of our customers was laid on my desk, which letter all must be compelled to believe, for it was absolutely unsolicited and from a man with a high moral standing, as his calling will indicate. The letter reads as follows:—

METHODIST EPISCOPAL CHURCH,
Rev. L. S. McKown, Minister.

O. A. Brictson, Pres.,
Brictson Mfg. Co., Brookings, S. D.

Dear Sirs:—I have been using the Brictson Tread on a Buick car for over two years, and I find that they give entire satisfaction. Since coming to this city I find every other Tread except the Brictson, and I am desirous that my friends get the best, hence I write for the agency, and your best net prices. And in order that I may be the first in the field here, please ship me by return Express, one set (4 Treads) of Brictson Detachable Tire Treads for tires 32x3½. Ship C. O. D.

Yours Very Truly, (Signed) L. S. McKOWN.

Vienna, Ill., March 15, 1911.

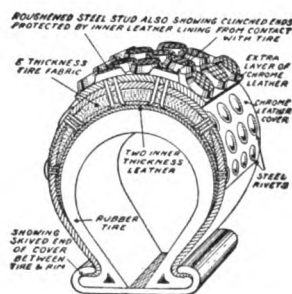
Right here I want to say that the treads referred to in the above letter were made two years ago, when we were in the experimental stage, and which goes to prove even though our treads were not perfected at the time, the principle was absolutely right. Think of a man running a car equipped with the same tires for two long years, all the while under "BRICTSON" DETACHABLE TREADS, and then ask yourself, "Do they rot the rubber tires?" I want to tell you, gentlemen, that this rotting, heating, burning, creeping, stretching, and injuring the rubber casing that you have heard so much talk about is all "bosh" with the Brictson, and I can prove it, not only by the above unsolicited letter, but by hundreds of others, copies of which will be gladly forwarded upon request.

Brictson Detachable Tire Treads

"The Enemy of Tire Expense"

The cross section illustration on this page represents the construction of the BRICTSON Heavy Car Type Tread. First there is a layer of specially tanned, extra pliable chrome leather. On the tread part outside of this leather is another strip of chrome leather, which entirely covers the tread surface that is exposed to the road. Next to these two thicknesses of leather are five layers,—did you get that?—five layers of the very best quality tire fabric. It would be an easy matter for us to use one, two, three, or even four layers of tire fabric in order to save money, but we have found from years of experience that it is absolutely necessary to use not less than five layers of the tire fabric to obtain perfect strength and to prevent the tread from stretching, that is why we use five layers of tire fabric. A tread made without sufficient fabric would be worthless on account of stretching, causing it to sag and become loose on the rubber casing. That is why all rubber casings are rivets are clinched into another layer of leather which immediately follows next to the tire fabric, and then there is yet another layer of chrome leather, which covers the clinched ends of the studs and rivets and prevents them from coming in contact with the rubber tire.

Is there any wonder then that users of "BRICTSON" DETACHABLE TREADS say they are the best tire protectors in the world? And you must certainly admit it after you have read and studied the foregoing construction and illustrations.



O. A. Brictson,
President,
The Brictson Mfg. Co.,
171 Brictson Bldg.,
Brookings, So. Dak.
Without obligation on my part,
send me your exclusive Agency Propo-
sition, 1911 Catalogue and Dealer's Folder.

Name.....
City.....State.....
County.....

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O. A. BRICTSON, PRESIDENT

The Brictson Mfg. Co.

171 BRICTSON BUILDING
Brookings, South Dakota

Dealer's Name.....

Size of Tire.....

Name.....

Address.....

MOTORIST'S COUPON.

I am interested and would like to know more about "Brictson" Detachable Treads. Send me your booklet, "The Enemy of Tire Expense," Proofs from Automobiles, Prices, etc.

O. A. Brictson,
President,
The Brictson Mfg. Co.,
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Brookings, So. Dak.

SPECIAL NOTICE

CONCERNING

K & W PATENT RELINERS

To Consumers, Dealers, Jobbers and Tire Repair People.



Reg. Applied For.
Above shows K & W Reliners strengthen tires so much that they may be worn entirely through without having blow-outs.

The K & W Patent Reliner

was "the first successful reliner" ever manufactured, and is, and always has been, made of a better quality of material than any imitation or infringement.

Remember, The K & W Patent Reliner is Fully Guaranteed.

TIRE REPAIR PEOPLE everywhere are using K & W Patent Reliners in their repair work, which proves they are a good thing to strengthen weak tires.

We guarantee K & W Patent Reliners to eliminate your tire trouble and tire expense and agree to refund money if reliners are not satisfactory in every way.

You might be surprised to know that there are nearly 25,000 K & W Patent Reliners in successful use at the present time.

EXHIBITED

At the New York and Chicago Shows, also at Boston, Minneapolis, Washington and Kansas City.

Be sure you get a K & W
IT'S BEST.

For sale by nearly all dealers, jobbers and tire repair companies. If your dealer does not have them, write us AT ONCE for our Proposition on a Trial Order.

K & W MFG. CO., 3rd St., Ashland, Ohio.

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As manufacturers of K & W Patent Reliners, which are sometimes called Inner-Shoes, Inside Tire Protectors, Inner-Tires or Tire Reinforcements, we are pleased to advise you that we own, **EXCLUSIVELY**, patents which are basic and which cover the reliner thoroughly. What the **SELDEN PATENT** is to the gasoline automobile—our patents are to the successful inside tire protectors.

No doubt you are aware that there are several imitations and infringements on the market, the manufacturers of which claim to have "something just as good." Our reliners are semi-cured; a feature which is covered by patents. Under-cured reliners tend to become cured by the heat generated by the friction of the tire on the road, while full cured reliners would become over-cured and deteriorate rapidly. This is why **semi-cured** reliners remain soft and pliable and are of long life.

The K & W Patent Reliner is coated with a vulcanizing compound which causes it to adhere firmly to inner walls of tire. Thus, it will not creep or generate heat by its use. This feature is also patented. Patents "also" cover coating inside of tire with a vulcanizing compound before applying Reliner.

Therefore, when anyone offers you a semi-cured or cement coated reliner by whatever name called, they are imitators or infringers unless the following dates of patents are stamped on inside of reliner:—"Dec. 28th, 1909, and Jan. 4th, 1910." Evidence is being secured against infringers and prosecutions will follow.

Why should you purchase these imitations and infringements when you can purchase the original "patented" reliner at no greater cost?

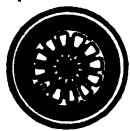


The above picture is no exaggeration. Note the following: Your "picture frame" or "collar" tire with man's head through it is no worse than the one that I had on my car, and it never blew out after the Reliner was put in.

Yours truly,
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19 1911

Automobile Dealer and Repairer



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REGISTERED IN U. S. PATENT OFFICE.

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NEW YORK, AUGUST, 1911.

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Free from Carbon.

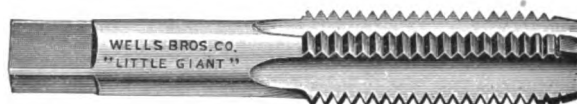
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Write for our booklet, "Polarine Pointers," to the nearest agency of the

Standard Oil Company

(Incorporated)

Little Giant.



Little Giant.

Are You Using Taps That Suit?

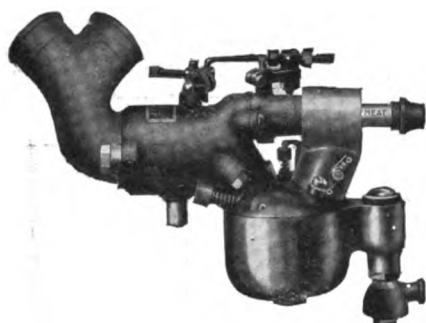
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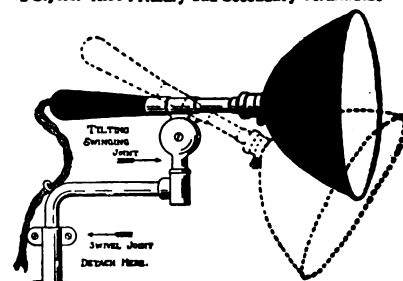
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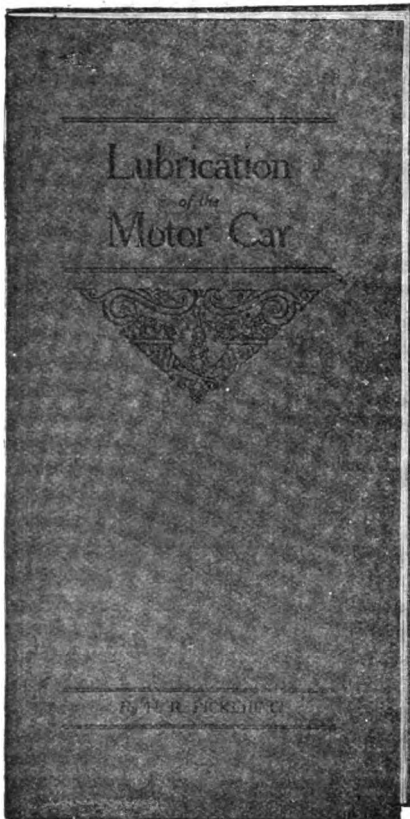


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Socket, 6v. 4 c. p. Lamp Snap
Clips.

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Lamp, Cord and Terminals.



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Be Sure!

The Book is FREE

Never before has such complete information on lubricating the motor car been printed in one book.

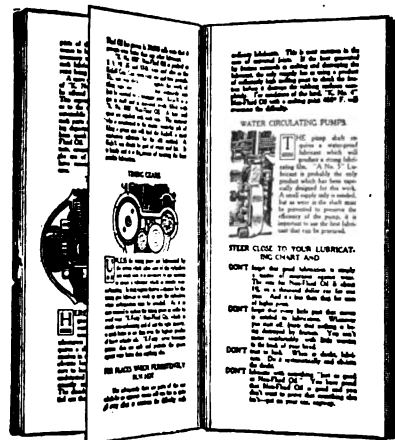
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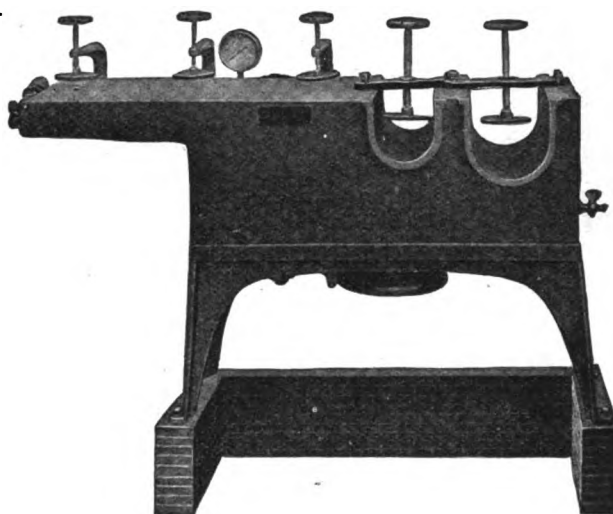
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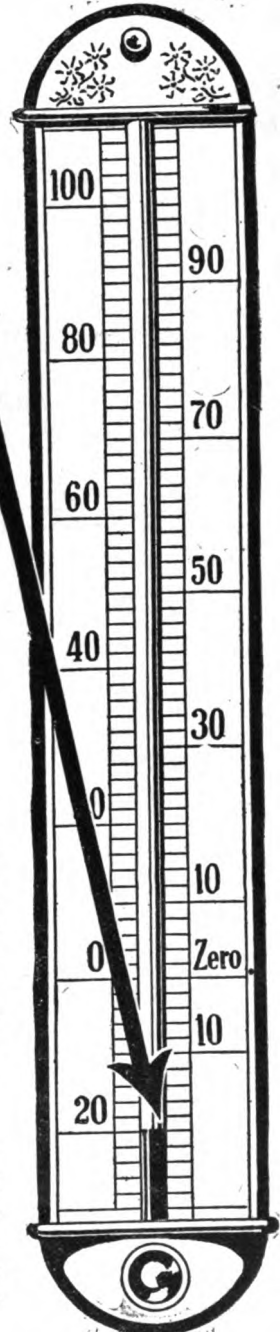
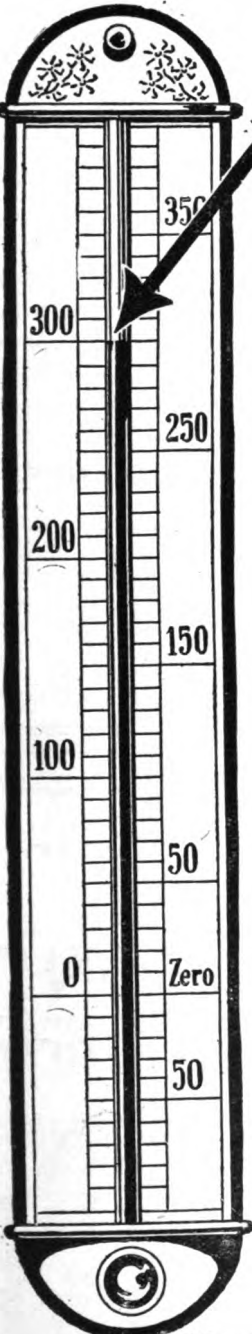
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Philadelphia, Pa.

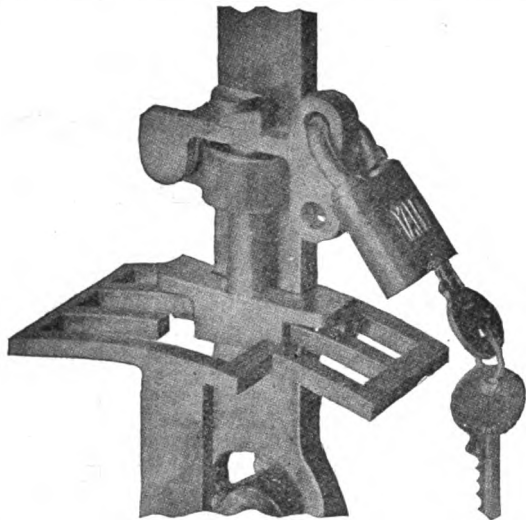
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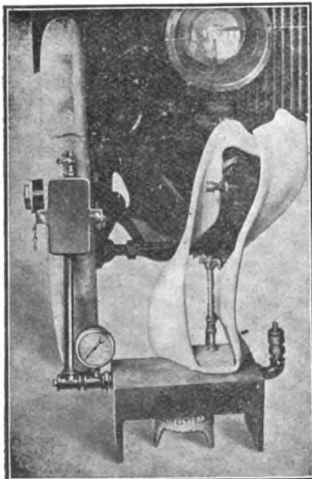
The **Saunders Auto Lever Lock** is fastened permanently on the transmission lever, and when locked at neutral, it is impossible to throw gears in mesh.

\$3.50 provides the necessary insurance against thieves for the life of your car. In ordering, send name, model and gear of car, and we will send you a lock with a positive guarantee of satisfaction or money refunded.

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For the OWNER or the GARAGE.



Will save 75% of your tire expense. A **child** can operate it. Occupies one foot of space. Cures in 15 minutes **three** inner tubes and a **cut** in a **case** at the same time, **without removing tires from wheel**. Steam generated in ten minutes by use of natural or artificial gas, or ordinary gasoline blow-torch.

We also have an **Inside Tire Vulcanizer** which can be used in connection with

the above, and by means of which a **blow-out** or **section** ten inches long can be repaired with one-half the material used by the average repairman.

TEN DAY TRIAL PROPOSITION. SOLD WITH A MONEY-BACK GUARANTEE.

WRITE FOR BOOKLET AND PRICES.

Motor Tire, Repair & Supply Co.,
5918 Baum Street, Pittsburgh, Pa.

Your First Ride on WESTEN SHOCK ABSORBERS

Will convince you that their smooth riding is worth many times their cost. But it will take some time before you can figure out the dollars saved in upkeep of engine, springs and tires.

Westen Shock Absorbers have the exclusive **two-degree friction** which allows them to **automatically adjust themselves** to the **ever varying conditions** of the roads. The resiliency of the springs is unimpaired but the absorbers take up the jolts

and smashes that would **waken engine, springs and tires.**

Made for three weights of cars.

Send for booklet giving details.

WESTEN MFG. CO.

288 Halsey St.

NEWARK, N. J.

DEALERS

Get Our Special Offer
on this money-making guaranteed

"SAMSON" Electric Horn



No. 1 Outfit
Wt. Packed
6 lbs.

Cast Brass Base
Spun Brass
Projector, 9 in. long,
12 ft. Cord and Push.

STRONG - LOUD - SIMPLE - RELIABLE

Write for descriptive circular and Price List.
For sale by dealers everywhere.

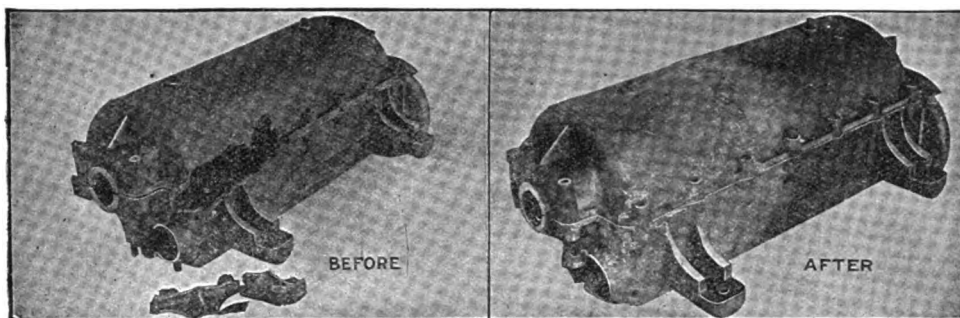
MADE ONLY BY

American Electric Company
State and 64th Streets CHICAGO, ILL.

ALUMINUM

WELDED AND GUARANTEED

Cast Iron
Steel
Bronze
Malleable
Iron



Crank Cases
Transmis-
sion Cases
Rear Axle
Housings
Manifolds
Cylinders
Frames

“THE WELDING” COMPANY

45 Bay Street,
SPRINGFIELD, MASS.

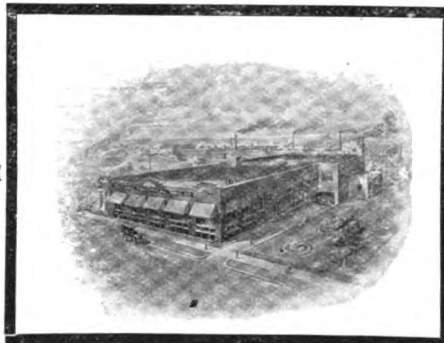
63 Southampton Street,
BOSTON, MASS.

38 Elm Street,
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GARAGE EQUIPMENT MFG. CO., 746 So. Pierce Street, Milwaukee, Wis.

Write for our Catalogue.

Our New Factory—The largest of its kind
devoted exclusively to the manufacture of
automobile accessories.



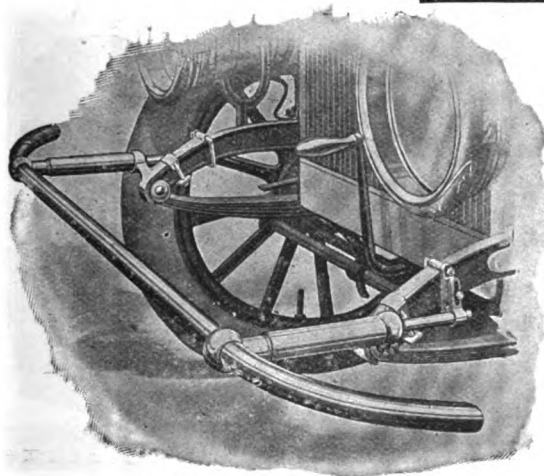
All our products are high grade
in quality, workmanship and finish
and you will find them salable and
profitable.

“Protect your Lamps and Radiator.”

The “UNIVERSAL” BUMPER

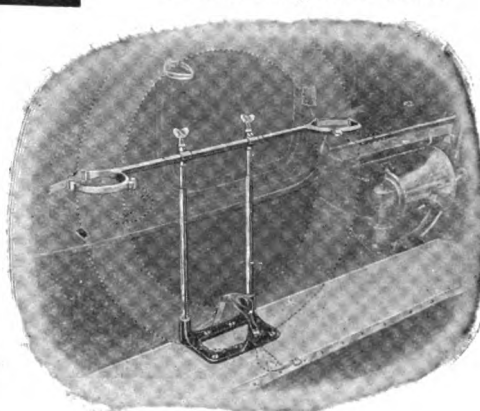
**FORE-DOOR Tire and
Demountable Rim Holders.**

Fills a Long Felt Want.



Will fit any car
without drilling
holes or remov-
ing bolts. Simply
clamps to the
frame. Strong,
serviceable, or-
namental.

Finished in
black, nickel or
brass.

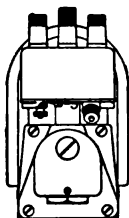


Contained entirely on the running board. Therefore it is
unnecessary to drill holes or otherwise disfigure the body of
the car. Can be adjusted to fit any sized tire.
Finished in brass or nickel. Made in two sizes.

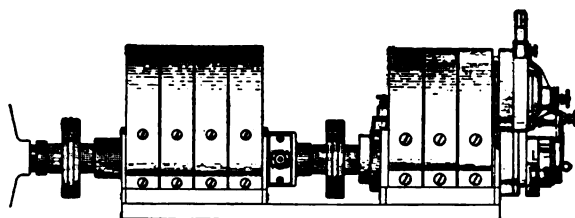
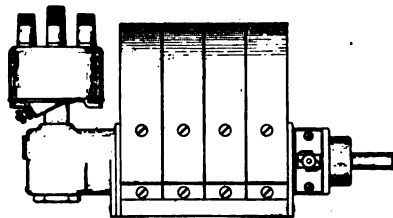
THE MATCHLESS

Electric Lighting and Ignition System

"Fine enough for any car made."



Matchless Generator with complete high tension ignition system.



Matchless Generator with high tension magneto directly attached.

An Electric Lighting System in which we have put a lot of brains and few parts. A Complete Lighting Plant designed by engineers and built by manufacturers. An Equipment which sells and stays sold. If it were an experiment, we wouldn't guarantee it for five years.

We invite correspondence with Dealers, Manufacturers, Owners and Prospective Purchasers of cars.

The Agency for the Matchless System is a Valuable Asset.

CATALOG 1500 D
FOR THE ASKING

THE ESTERLINE COMPANY

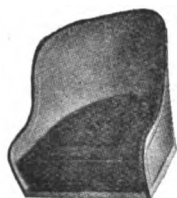
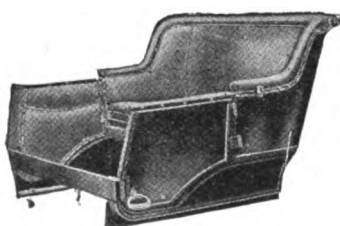
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LAFAYETTE, - - INDIANA

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CARD WILL DO

SEATS, \$10.00 to \$35.00

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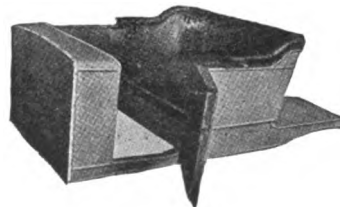
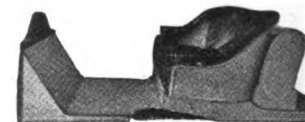
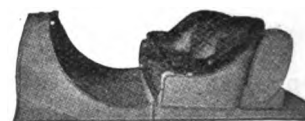
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LEATHER
GOODS

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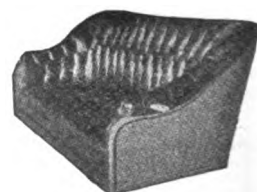
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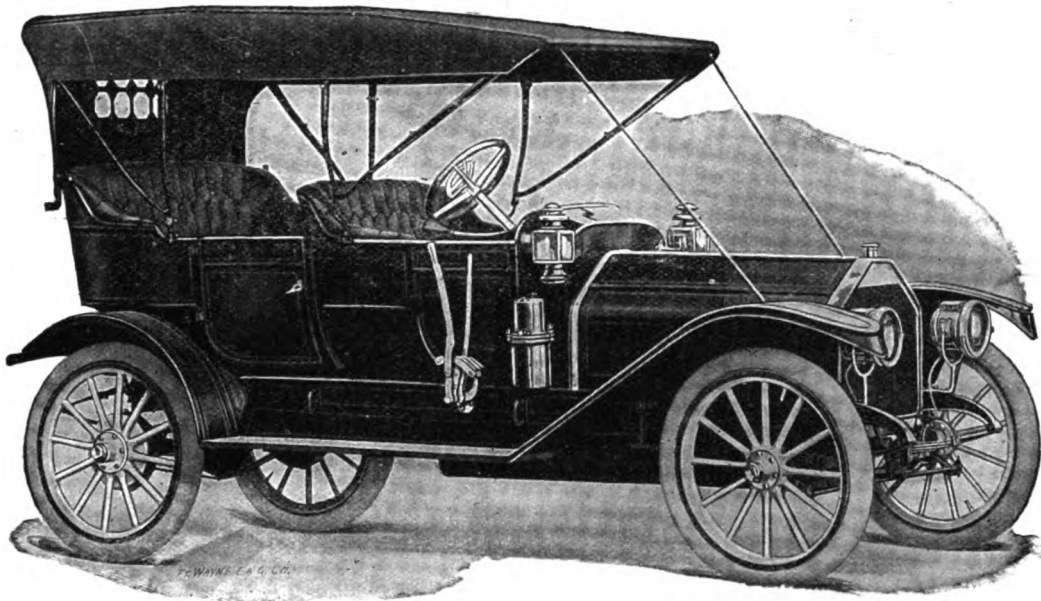
SEATS AND BODIES FOR ANY CAR

Special Seats for the Maxwell, Ford, Reo, Brush, Buick, Hudson, Flanders and others. When writing mention name and model of your car.

GRAND HAVEN AUTO BODY CO.
Grand Haven, Mich.



McIntyre SPECIAL ANNOUNCEMENT



A new model of a Five Passenger fore-door Touring Car that is RIGHT even in the smallest details. Model "D12," \$1,000.00

WE INVITE COMPARISON

MOTOR: 4 Cylinders, water cooled. Bore $4\frac{3}{8}$ inches, stroke $4\frac{3}{4}$ inches. Cylinders cast in pairs. A THOROUGHLY RELIABLE MOTOR WHICH EASILY DEVELOPS 85 H. P.

Valves located on one side and have a diameter of $1\frac{7}{8}$ inches, with a lift of $\frac{3}{8}$ inch. Pistons are extremely long. 3 Piston Rings. Crank case aluminum. Crankshaft is drop forged, and crankshaft bearings are $1\frac{5}{8}$ inches in diameter, $4\frac{5}{8}$ inches long at flywheel end; $1\frac{5}{8}$ inches in diameter and $2\frac{1}{2}$ inches long at the center; $1\frac{5}{8}$ inches in diameter and $3\frac{5}{8}$ inches at the starting end.

Connecting rod bearings are $1\frac{5}{8} \times 2\frac{3}{8}$ inches.

BEARINGS: Parsons white brass. **VALVES:** Nickel steel.

LUBRICATION: Self contained oiling system operated by pump.

CARBURETOR: Schebler. **IGNITION:** Magneto and batteries.

CLUTCH: Cone. **TRANSMISSION:** Selective three speeds forward and one reverse.

FRAME: Pressed steel channel section.

SPRINGS: Semi-elliptic in front and full elliptic in rear.

WHEELBASE: 114 inches. Gear ratio $3\frac{1}{2} \times 1$. Shaft drive.

WHEELS: Heavy artillery type. **TIRES:** $34 \times 3\frac{1}{2}$ inches ($36 \times 3\frac{1}{2}$, \$25.00 extra).

EQUIPMENT: 2 Oil lamps, tail lamps, acetylene headlights with generator, horn, jack and tools.

COLOR: Body dark blue with pearl gray wheels.

GASOLINE TANK CAPACITY: 20 Gallons.

GUARANTEE: ONE YEAR.

This roomy and sturdy car is the greatest value ever offered for \$1,000.00.

Special Equipment: Mohair top, top cover, wind shield, speedometer and electric horn, \$125.00 extra.

Up-to-date and energetic dealers are requested to communicate immediately with the home office as the output of this remarkable car is limited.

The first deliveries are now being made.

We have tried this car out in every way and under all conditions of roads and climate and can positively guarantee this model to be without a flaw or weak point.

W. H. McINTYRE COMPANY
Department E, **AUBURN, INDIANA**

The Incomparable 400 Blower, the one great Helium that will be handed down from one Generation to the other. Ask What the Owners Say.

The 400 Steel Blower will serve the youngest mechanic faithfully without expense for a long lifetime.

Crank turns either way.



The Famous 400 Champion Steel Blower.

Over one half million 400 Champion Steel Blowers and Steel Forges in use. Forever run easy, smooth and noiseless.

The No. 400 Champion "Whirlwind" Blast Anti-Clinker, Heavy Nest Tuyere Iron is furnished with all 400 Blowers WITHOUT EXTRA COST.



No. 408 Steel Blacksmith's Forge.



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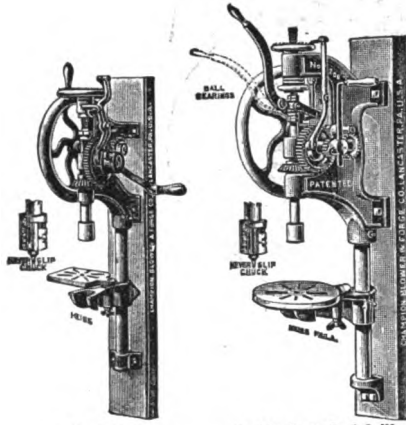
Champion "Patented" Automatic Self-Feed and Lever-Feed Upright Post Drills

Made With Ball Bearings only

With the LEVER- or AUTOMATIC SELF-FEED 95 per cent in Time and Labor is Saved by the INSTANTANEOUS RAISING of the Drill Bit out of the hole just bored and again replacing the drill bit back on the material ready to bore the next hole.

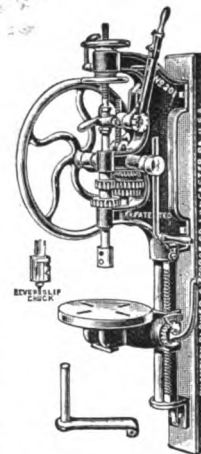
Remember—There is no TURNING BACK of the FEED Screw NUT WITH EITHER FEED.

Before purchasing a Hand Blower, Forge, Drill Press, Tire Bender, Tire Shrinker, Screw Plate, Power Blower, or Electric Blower, write for our free catalogue, which always shows the greatest variety of improved Blacksmith tools built under one control in the world.

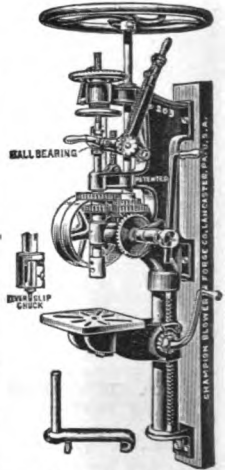


No. 90 Drill.

No. 200 Lever-Feed Drill.



No. 201 Self-Feed and Double Compound Lever-Feed Drill.



No. 203 Self-Feed and Double Compound Lever-Feed Drill.

THE CHAMPION BLOWER & FORGE CO., Lancaster, Pa., U. S. A.

20th Century Tire Protector.

WILL DO WHAT YOU EXPECT IT TO DO

Long Life

Economy

Safety

GUARANTEED,
SAFETY,
ECONOMY,
RELIABILITY
and thorough
SATISFACTION

What more could you ask? Goods will be shipped subject to your thorough examination and approval without a penny's cost to you. Consider our proposition before spending more money on your Tires.

OUR EMERGENCY PATCH HAS NO EQUAL.

Money refunded if not perfectly satisfactory in EVERY respect,—you to be the judge.

Write, 'phone or wire for "Tire Sense," our booklet which gives detail and Special prices.

20th CENTURY TIRE PROTECTOR CO.

MAIN OFFICE AND FACTORY, MIDLOTHIAN, TEXAS.

Branch Offices: 411 Slaughter Bldg., Dallas, Texas.

166 Adams Street, Chicago, Ill.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

SELL WHAT EVERY CAR OWNER NEEDS.

The handiest, dandiest of tire repair outfits—

FIX TIRE

List, - - \$2.00 an Outfit.

(In the orange-striped can.)

EASY to use. Satisfactory when used.

A sure, permanent repair for punctures and blowouts, made without tools, heat or vulcanizing.

FIX TIRE has solved the tire problem for the car owner because it so simplifies the repairing of casing or tube that *any one can use it successfully.*



A Fair and Square Deal For You; For Your Customers.

FIX TIRE must satisfy the purchaser or he gets his money back. We back you in this guarantee. Our proposition to dealers is at once fair, square and liberal. Let us explain it.

How You Can Get a FIX TIRE Outfit Free.

To enable dealers, garage men and repair men to get a true line on FIX TIRE by personal use of it, we have a plan whereby they can secure an outfit free. We will explain this plan in detail upon request.

Write Us.

Motor Accessories Makers,

INC.,

84 Jackson Blvd., Chicago, Ill.



This Hanger, 11x14 inches, in colors, furnished to dealers, garage men and repair men, free of cost.



STOP ANY Buying
OLD PLUG
INSIST ON GETTING A
MONARCH



Guaranteed for 365 Days.

75 Cents Each, 4 for \$2.00

You cannot buy better spark plugs or timers than a MONARCH. Others sell for a great deal more money and these do not represent near the quality that MONARCH Spark Plugs and Timers do.

We offer you the very best that can be manufactured for the least money. A sample order will convince you.

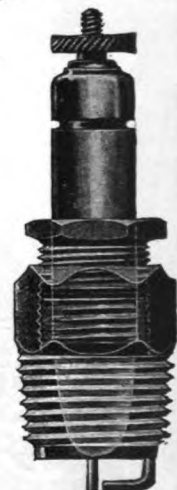
MONARCH TIMERS

For Reliability Cannot be Beat. Guaranteed for one year.

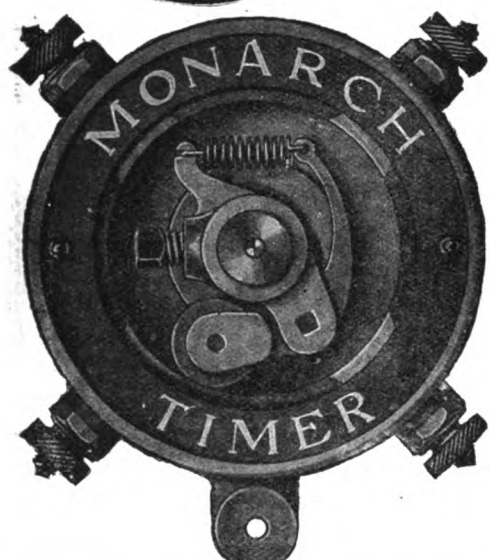
1 Cylinder, \$2.75 2 Cylinder, \$3.00
3 Cylinder, 3.50 4 Cylinder, 4.00

SPECIAL SHORT SHAFT TIMERS FOR FORD, BUICK AND MAXWELL CARS.

THE BENFORD CO., Mt. Vernon, N. Y.



PORCELAIN
OR MICA,
MAGNETO OR
BATTERY TYPE.



Prest-O-Tire Tube

TRY IT ONCE—NO MORE FOOT PUMP FOR YOU!

This handy tube inflates an empty tire, or several partially deflated ones, without delay, perspiration or strong language. Simply turn a little valve, releasing the pressure, and the tire is inflated.

A life-saver on a hot day!

Tube with valve and hose connection, \$3. Extra tubes, \$1 each (carry as many as you wish—they're small and easily stored in the tool box). Full tube, in exchange for empty, 20 cents at any of our agents.

If your tire is bigger than 4 inches, get the larger size of Tire Tube. It costs \$1.25, uses the same valve, and can also be exchanged for 20 cents.

PROVE IT Ask your dealer for the outfit—try it thirty days—your money back if you are not satisfied.

Each tube comes to you hermetically sealed—no chance for leakage.

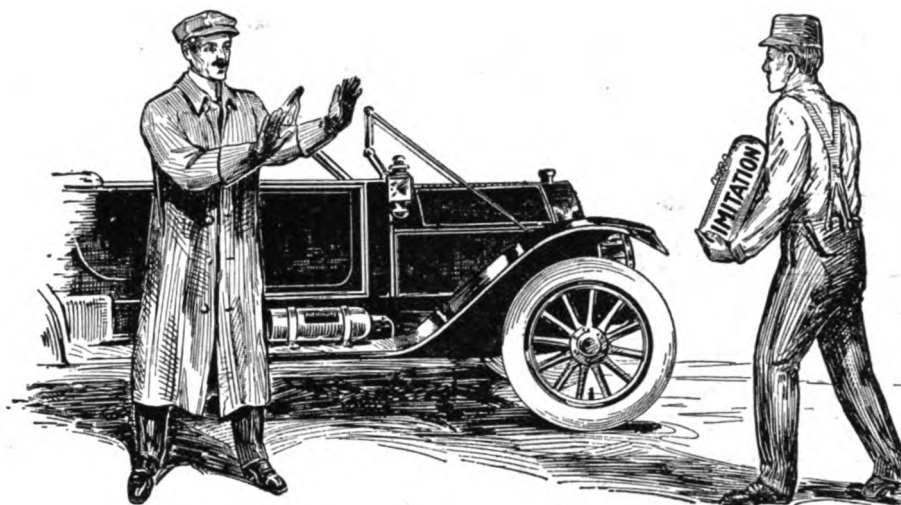
Your dealer has it. If he hasn't, ask him to order it for you, or write us.

THE PREST-O-LITE CO. 251 East South St.
Indianapolis, Ind.

EXCHANGE AGENCIES EVERYWHERE

"THE EASY WAY"





“Keep your imitations for folks that haven't been through the mill.”

“Give me the genuine Prest-O-Lite!”

“I had an imitation once. The dealer said it ‘held more gas,’ ‘cost less,’ etc. Maybe he believed it, too—I did, for a while. I got poor gas and less gas.

“One night my tank ran low. I ran into a little town and tried to exchange my empty tank for a full one. Nothing doing! The Prest-O-Lite Co. had its agent there—there’s one in nearly every village in the country—to give service to Prest-O-Lite users.

“But, you see, I didn’t have a Prest-O-Lite Tank. I had this ‘maybe-it-holds-more-gas’ affair, and there was no place where I could exchange it for a full tank. Never again!

“Not long after that, the makers of that imitation got tired of the business and quit. Their tanks were then worthless because they could neither be sold nor re-filled.

“No more counterfeits for me!”

And, Mr. Dealer, are you playing a good game when you buy and sell imitations?

You know that no imitation gives or can give the exchange service that the Prest-O-Lite Tank does. And if your customer doesn’t know it, he’ll quickly find it out. Whom will be hold responsible? YOU!

You know that no imitator can duplicate Prest-O-Lite Service until he duplicates the world-wide Prest-O-Lite organization. It took the Prest-O-Lite people six years to perfect their organization. To create its equal, (even if it were possible) under present conditions, would take 20 years. In the meantime, hadn’t you better let the imitator experiment with his own money, and not with yours?

The Prest-O-Lite Co., 251 East South Street, INDIANAPOLIS, IND.

Branches at Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Jacksonville, Kansas City, Los Angeles, Milwaukee, Minneapolis, New York, Omaha, Philadelphia, Pittsburgh, Providence, St. Louis, St. Paul, San Francisco, Seattle.

Charging Plants: Atlanta, Cleveland, Dallas, E. Cambridge, Hawthorne, Indianapolis, Long Island City, Los Angeles, Waverly, Oakland, Omaha and Seattle.

Foreign Agencies: Honolulu, H. I.; Manila, P. I.; San Juan, P. R.; Toronto, Can.; Vancouver, B. C.; Havana, Cuba; City of Mexico; London, Eng.; Berlin, Germany.

Exchange Agencies Everywhere

Please mention the Automobile Dealer and Repairer when writing to advertisers.

You dealers who cater to the Touring Trade

It will prove mighty profitable for
both you and your tourist custo-
mers if you supply them with

United States Tires

Continental Hartford
G & J Morgan & Wright

These are the easiest tires in the world to sell to tourists. A man who buys tires for the long, hard grind of touring is the man who investigates tires the most thoroughly.

A large proportion of the tourists who stop at your store this season to buy tires will call for United States Tires. Thousands of them have proven by actual experience that they cannot afford to tour on any other brand.

An abundance of reserve strength is the secret of the superior service which United States Tires give in touring—reserve strength made possible by combining in one tire the strength of four—Continental, G & J, Hartford and Morgan & Wright.

A tire which is built just strong enough to stand up under ordinary service will probably be just weak enough to give way when it hits a sharp obstruction on a mountain road, or bumps over a country railroad crossing.

That such extra-severe service is amply provided for by the makers of United States Tires, is best proven by what tourists say of them.

Here is a sample of the feeling the majority of tourists bear toward them. It comes from a man who does his touring in a mountainous country—the hardest kind of service imaginable.

Denver, Colo., April 14, 1911.
We equipped our car with a set of United States Tires during the latter part of September, 1910. The car was driven 2000 miles inside of 30 days, nearly all of it was mountain work. The car then made a trip to Omaha, Kansas City and return, making a mileage of 1748 miles in 7 consecutive days, with only 2 punctures. Since then the car has been driven almost continuously, running an average of 5000 miles. The tires are still in use and are in good condition. The Nooby Tread has been an aid in getting better traction both on muddy and sandy roads. Mud or skid chains have never been used on the car.

Yours very truly,
(Signed) H. C. COLBURN.

**Good reliable service and lots of it
That is the kind of service every
tourist wants and the kind United
States Tires will give**

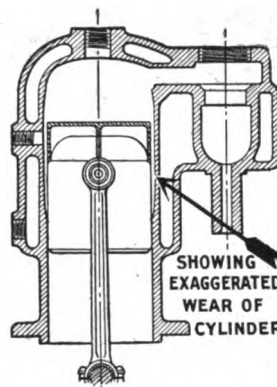
United States Tire Company

Broadway at 58th Street
NEW YORK



THE UNDERWOOD METHOD OF REBORING AUTOMOBILE CYLINDERS

assures you of obtaining the highest class of
work in this line.



There comes a time when the cylinders, through wear or cutting, lose their compression. A couple of years ago you would probably have been compelled to get new cylinders.

We have designed special machines for reboring the cylinders, and are also properly equipped for fitting new pistons and rings.

This means that at a very reasonable price you can have the equivalent of a new motor.

It is our process and our manner of doing this work which secures the best results.

Send the cylinders to us, and your car will have its old-time power and efficiency restored.

There is no reason in the world why you have to tolerate a motor which is wasting both fuel and power because of worn-out cylinders.

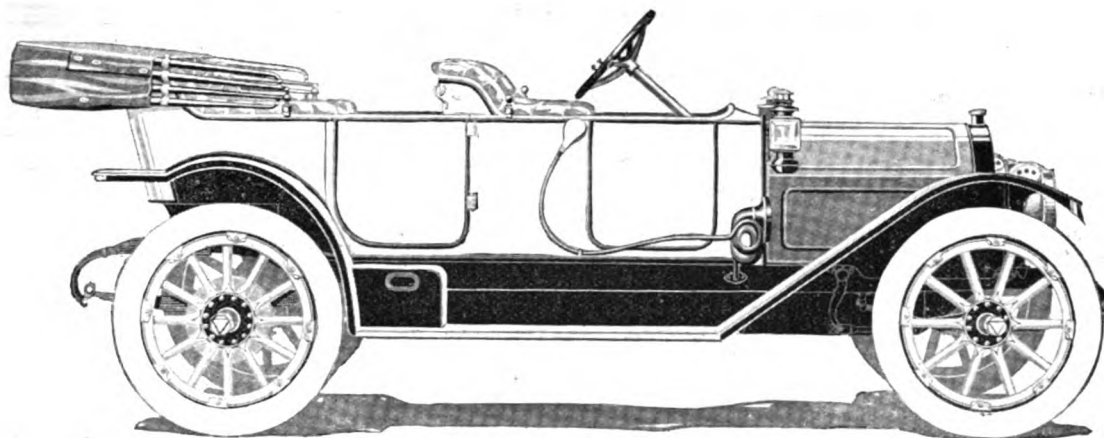
Get busy now. Send the cylinders. Our workmanship is guaranteed.

H. B. UNDERWOOD & CO.

1019 Hamilton St.

Philadelphia, Pa.

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"33" Touring Car—\$1600 Complete

Five-passenger. Bosch magneto and storage battery, genuine mohair top, glass windshield, 34x4 inch tires on Demountable Rims, extra rim and tire irons. Inside control. Fore-doors, full lamp equipment with Prest-O-Lite tank, big, beautiful lamps enameled black. Robe and foot rails, cocoa mat. Tool box on running board. Tools, license number holders. Tire repair kit, etc.

The 1912 HUDSON "33" Now on Exhibition Everywhere

You can see the 1912 HUDSON "33" today at any HUDSON salesroom. It has many improvements, many refinements and much additional equipment that makes it an even greater value than was the HUDSON "33" of 1911. Price now includes full equipment.

Since you are familiar with the 1911 car, then you must be curious to know how it has been possible to increase its value.

The one advanced automobile of the past three years is a greater bargain this season than last. It is larger, handsomer, more completely equipped and higher finished than ever.

You have heard more, about the HUDSON "33" during the past year than you have heard about any other car. It is invariably mentioned in automobile talk whenever medium priced cars of quality are referred to.

Less than a year ago the first HUDSON "33" was delivered to a buyer. Before then leading experts of the industry had seen and pronounced it to be Howard E. Coffin's Masterpiece. The four previous cars that he had built were the sensations of their times. He had never built a failure. His skill had been recognized by the leading engineers and manufacturers.

Naturally, then, anything he designs is a subject of great interest in the automobile world. The HUDSON "33," because of its simplicity, with some 900 fewer parts than are used on other cars—the dust proof features—the many provisions for strength—the manner in which body squeaks are prevented and the flexibility of its new type of motor, at once became the automobile sensation of the year.

All that is history. The months that have passed have seen the positive proof that the quality of the HUDSON "33" was not overestimated. The thousands of cars delivered, that are daily traveling the roads of practically every county in America, of every continent and of most every country, are showing that the HUDSON "33" is even a greater value than it was claimed to be.

There was nothing to correct in the HUDSON "33." The most severe tests ever given

to an automobile failed to show wherein there was need for change. But even though conditions did not demand it Howard E. Coffin did; and so we are giving a greater value today than was possible when the first HUDSON "33" was brought out.

WE HAVE SPENT LAVISHLY

In equipment, a vast improvement has been made. Last season the car with lamps was quoted at a price which did not include top, glass wind shield, magneto and Prest-O-Lite tank, for which an extra charge of \$150 was made.

This year the car is sold complete. In addition to a genuine mohair top, a Bosch magneto, Prest-O-Lite tank, large tires—34 x 4 inches instead of 34 x 3½ inches—Demountable Rims are furnished. An extra rim for spare tire and tire irons are also included. This entirely overcomes road troubles due to punctures and blow-outs.

We have not spared expense in any particular in making the HUDSON "33" the greatest value on the market. As a prominent publisher in Idaho writes us, "I never realized to just what perfection the industry had brought engines, transmissions and running gears until I drove a HUDSON '33'." This from a man who uses his car, not on boulevards, but upon mountain paths, with steep grades, sand and other trying conditions which demand the sturdiest service of any car that can be used there.

Thousands express a similar admiration for the HUDSON "33." To such a value add the things we have incorporated in the 1912 car. We are furnishing a better equipment, by far, than you will find on most cars selling under \$2,500. We have a better opportunity now to choose and select materials and our men have become more skilled in their work.

These things make for better value. Knowing what the 1911 model is and seeing what has been done in the 1912 car, you will be convinced that it is the best value ever offered in a moderate priced automobile.

FOUR MODELS

There are four models now. The Touring Car with Fore-Door, shown above, large and roomy, for five passengers; the Torpedo which carries four; a two passenger Roadster, enclosed body—the most comfortable car of its type you have ever ridden in—and the MILK-A-MINUTE ROADSTER, that is faster than its name implies.

All on the famous "33" chassis. The price of either model is \$1,600 with equipment.

The 1912 cars are furnished with handsomer, larger lamps, heavily enameled in black. There is little exposed brass about the car. The expense, annoyance and trouble of polishing is thus reduced.

It would take a lot of space in which to enumerate all the many refinements that have been brought out in the 1912 HUDSON "33." Perfection seemed so nearly attained in the 1911 model, that to make clear how we have more closely reached that state in this new car is out of the question here.

You must see the car and note how the lines are even more striking and beautiful. You must hear the motor, for then you will marvel at its quieter operation. This is wonderful, for the original HUDSON "33" is famed for running as quietly as any car on the market.

Your dealer has a car now to show you. There were some 2,000 unfilled orders on our books at the close of the 1911 season. At no time were we able to meet the demand from those who wanted Howard E. Coffin's Masterpiece. Dealers, in many instances even, were unable to keep demonstrators, so insistent were buyers for immediate delivery.

Does not that situation in connection with the greater value of the car this year, indicate that a HUDSON "33" can be had only by those who act promptly?

If it is not convenient to call on the dealer, send for literature.

See the Triangle on the Radiator

HUDSON MOTOR CAR COMPANY

7070 Jefferson Avenue, Detroit, Mich.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

"BEST" The Hotter the Weather
The Better It Sticks



RUBBER CEMENT

For repairing Automobile and Bicycle tubes and tires.

This cement will do anything in the way of cementing. It will cement rubber to leather.

Best there is for plugging purposes.

If your dealer does not handle our cement, send us 40 cents in stamps and we will mail you a 4 oz. tube; or 90 cents for 1 dozen No. 1 tubes. Jobbers and Dealers write for our prices and discounts of Quality Cement.

IN THE
WORLD

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QUALITY CEMENT COMPANY,
FERNWOOD, DEL. CO., PA.

HENRY E. EBY, Gen. Mgr.

The Acid Test of Performance

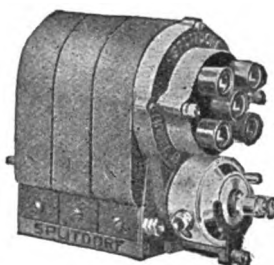
conclusively proves the supremacy of the

Splitdorf Magneto

In every contest of speed and endurance in which it has taken part SPLITDORF Ignition has always shown remarkable Efficiency and Reliability.

Indeed, it has become a truism among the most experienced motorists that SPLITDORF Ignition has no equal.

Please ask for Magneto Catalog



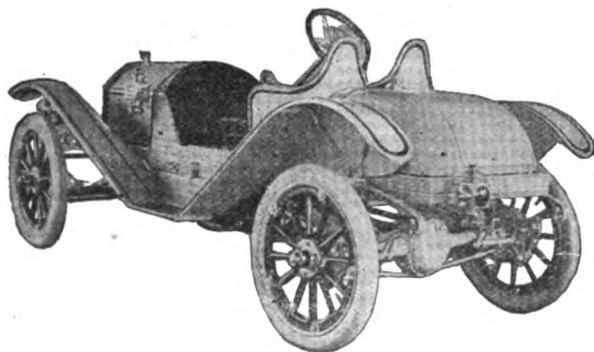
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Walton Ave. and
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G. J. G. "Junior"



The G. J. G. "JUNIOR" is a racy-looking runabout that is **GUARANTEED FOR ONE YEAR**

ITS 22-26 H. P. gives you plenty of speed, and a reserve for the worst kind of hills and "bad going."

Its equipment includes a Bosch high tension magneto and Dorian quick-detachable re-mountable rims, with an extra rim for 32x3½ inch tires, gas head lights and generator, oil side and tail lights, and many other excellent features.

The G. J. G. "JUNIOR" is the equal of the average car selling for 25 per cent. more than it does. Compare it with any car selling for \$1,250 to \$1,500. You will find that the G. J. G. "JUNIOR," that costs you only \$1,000 with full equipment, is the superior.

Write us for literature and agency proposition.

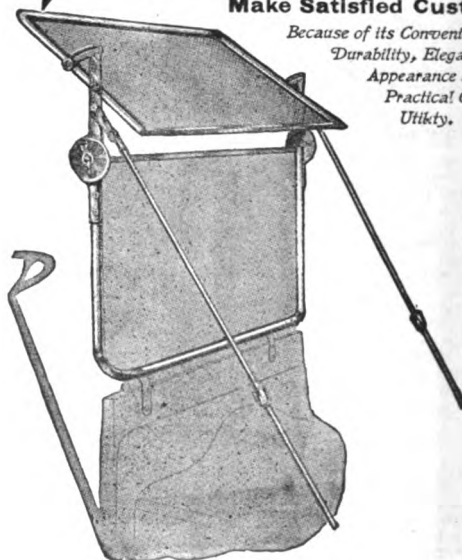
G. J. G. MOTOR CAR CO.
WHITE PLAINS NEW YORK

VASCO

WIND SHIELDS

Make Satisfied Customers

*Because of its Convenience,
Durability, Elegance of
Appearance and
Practical General
Utility.*



Position for rain, snow and sleet. You see the road between the sashes.

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The demand for "VASCO" Shields has been established and is increasing rapidly, owing to the extensive advertising campaigns which have been inaugurated and the unprecedented values offered. Prices have been reduced to the lowest possible basis consistent with superior construction and material. Our agency proposition is exceptional. Write for it now, as your territory may still be unallotted, and we want you to participate with our other dealers in the business resulting from our campaign. Do not delay but write to-day.

VICTOR AUTO SUPPLY MANUFACTURING CO., 35 West 43d Street, New York City

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WOODWORTH TREADS Make All Roads Good Roads.

If Your Car is Equipped with WOODWORTH TREADS You Need Have No Fear of the Road

WOODWORTH TREADS are tire protectors made of a specially treated chrome leather re-inforced by a three-ply Egyptian fabric, studded with steel rivets. On the middle portion, the rivets have thick heads that give long wear and prevent skidding; on the sides are flat head rivets which lie close to the leather so that ruts and rocks cannot catch and force them out.

The WOODWORTH TREADS are held on the tire by very strong coil springs along the sides, that automatically tighten the treads, keeping them smooth and snug. There can be no looseness or wrinkling to chafe and heat the tire.

They fit all makes of tires; anyone can put them on without taking the tires off the rim. An instruction tag, telling how to do it, is tied to every tread before shipping.

HOW WOODWORTH TREADS SAVE TIRES.

WOODWORTH TREADS prevent all road wear on the rubber:

They prevent cuts from glass, stones, scrap iron, etc.

They prevent punctures from nails, etc., that damage the tire shoes and frequently destroy the tube.

They prevent oil on oiled roads from getting on the rubber and rotting it.

They prevent the small cuts and wounds which do not reach the tube but allow dirt and moisture to get in and rot the fabric, causing blow-outs.

They prevent skidding, which scuffs off the rubber and often causes series accidents.

WOODWORTH TREADS are not an experiment. We are the oldest manufacturers of tire protectors in America and the largest in the world. Many people have been using WOODWORTH TREADS for the last five years. The 1911 Tread with the coil spring adjustment is the result of six years' experience and we guarantee them to give good results in every way.

Send for catalog and free pamphlet entitled "The Preservation of Auto Tires."

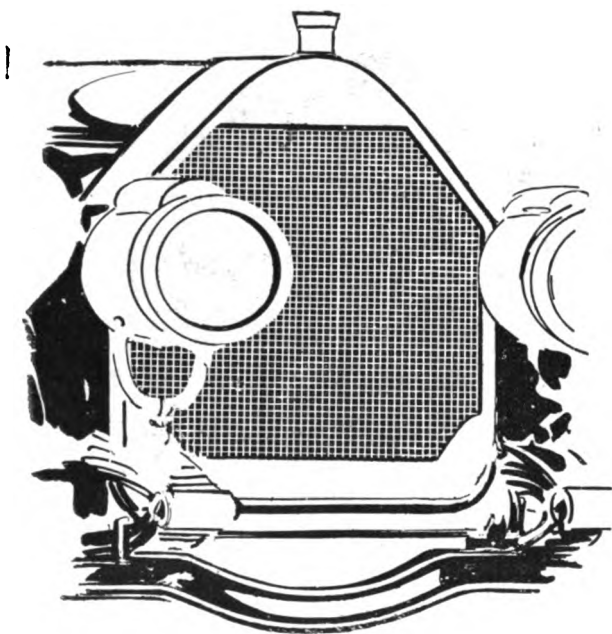
A SOUVENIR KEY RING WILL BE SENT TO EVERYONE MENTIONING THIS PAPER.

LEATHER TIRE GOODS COMPANY,
NIAGARA FALLS, N. Y.



This Big New Maxwell

1912's Undisputed Leader



POWER, STYLE and RIGHT PRICE will determine the successful car of 1912. In building the new MAXWELL SPECIAL, the 36-horsepower Touring Car for \$1280, the United States Motor Company has developed these elements to their utmost. Never before has such a car been offered at this price.

We realized that most cars today are reliable and efficient. Therefore, we set out to build a car that would outclass all others in these three essentials.

We instructed our corps of engineers to embody abundant power and surpassing style in this new car, knowing that our purchasing and manufacturing facilities enabled us to build the car at a lower price than any of our competitors.

When we were satisfied with the car, we found we could fix the price at the surprisingly low figure of \$1280.

The new 36-h.p. Maxwell Special unquestionably assumes instant leadership for 1912.

Power The Secret of power in this new Maxwell Special is its $4\frac{1}{2} \times 5\frac{1}{2}$ long stroke, smooth-running motor.

Large valves, adjustable push rods, self-contained automatic oiling system, Stromberg carburetor, dual ignition with Splitdorf magneto and batteries, combine to produce more power and greater speed than will ever be needed.

The power is there for emergencies. Gear shifting is reduced to a minimum, as this car takes the steepest hills with ease.

Other mechanical features include large clutch discs, full-floating rear axle, sliding-gear transmission, drop-

forged "I"-beam front axle and Columbia Honeycomb type of radiator. Wheel-base, 114 inches.

Style The new ventilated fore-door, flush-side vestibuled steel body, with inside control, is the very latest thing in motor car design. Its sweeping curves with a Columbia Honeycomb type radiator, new designed bonnet, and long, smooth flush-sides are strikingly beautiful.

Finished in Royal green with Wedgwood green wheels and black upholstery, deep and well tufted, this car has an atmosphere found only in the most expensive cars.

It is an aristocrat; the most artistic creation of the season.

Price The price of this car is made possible by the unequaled factory facilities of the United States Motor Company, now recognized as the leading builders of automobiles in America. No car selling for \$500 more than the price we ask can match the Maxwell Special. Comparison with other cars will prove this statement beyond argument. We urge comparison.

We announce three other new models—all ready for August Delivery: The Maxwell Mercury, a 30-h.p. mile-a-minute Roadster, \$1150. The Maxwell Mascotte, a 25-h.p. Touring Car, \$980; Roadster, \$950. The Maxwell Messenger, a 16-h.p. Runabout, \$600.

36 hp Touring Car for \$1280

Never such a car at such a price

MAXWELL MERCURY

Here is a test-proven mile-a-minute roadster with smooth, flush-side vestibuled and ventilated fore-door body, which is the height of perfection. Wheel-base, 110 inches. It is equipped with high-tension racing magneto, Stromberg carburetor, Columbia Honeycomb type of radiator with new designed hood, demountable rims, and a wealth of refinements, and is listed at \$1150 (top extra). It is another instance of extraordinary Maxwell value.

MAXWELL MASCOTTE

No car has ever achieved such wide-spread popularity as the Model "I" of which the MASCOTTE is the offspring. There has never been a complaint against this car.

We regret our inability to supply all the cars of this type that were demanded this season, but the increased production next year should enable us to meet the demand. It is the prettiest four-passenger touring car you have ever seen.

Among its features and refinements are a four-cylinder motor (4x4), supplying 25-h.p.; 104-inch wheel-base; new ventilated fore-door vestibuled body with smooth flush-sides and inside transmission control, artistically finished in dark blue with battleship gray wheels; oil reservoir, cast integral with the crank case; Columbia Honeycomb type of radiator with new hood of beautiful design; irreversible worm steering-gear mechanism; Stoddard-Dayton type of

spark and throttle control under steering wheel which will be 17 inches in diameter; springs of imported English steel, ball-bearings of German Chrome Vanadium. The touring car with extra-wide rear seat, \$980; fore-door roadster, \$950.

MAXWELL MESSENGER

This runabout with numerous refinements is beautifully finished in dark blue, with light-blue wheels. The car should have no trouble in retaining the leadership in runabouts held by its predecessor, known as the Model "AB." Every manufacturing year has seen a shortage in these cars. It is unquestionably the greatest utility car ever designed for merchants and physicians. The price is \$600, equipped with magneto, top, three oil lamps, two gas lamps and generator.

Something about the United States Motor Company

Buyers in 1912 will insist upon cars made by substantial concerns that are long past the experimental stage and whose cars will not decrease in value because of inability to get parts, or the fact the company is no longer in business. The United States Motor Company, now considered the leading builders of automobiles in this country, has capacity to manufacture 35,000 cars for the 1912 season. The Company has a capital of \$42,500,000. It employs 14,500 men in 12 manufacturing plants throughout the country, with 27 branches and 1800 dealers to care for your car. Its guarantee, therefore, is worth something.

45,000 MAXWELLS IN DAILY USE

They are used by enthusiastic owners—which best tells the story. Used by 14,000 physicians, who require admittedly the most consistent and reliable service—that's positive proof. 91% of the 5-year-old Maxwells are again registered in New York this year, according to the official figures of the Secretary of State.

Satisfied Owners' Free Inspection Service

To facilitate constant and unfailing service of Maxwell cars, and to eliminate unnecessary repairs caused by oversight of required minor repairs and adjustments, lack of experience in, and mechanical knowledge of, the construction and skillful operation of his car, upon the part of the owner, we have instituted a Free Inspection Service.

The few motor troubles in cars of today are generally due to neglect of unsuspected minor difficulties and can be avoided by frequent inspection and instruction as to proper adjustment.

For one year after date of purchase; a Maxwell owner may take his car to the nearest Maxwell branch or dealer once a month, if necessary, for a thorough inspection without charge.

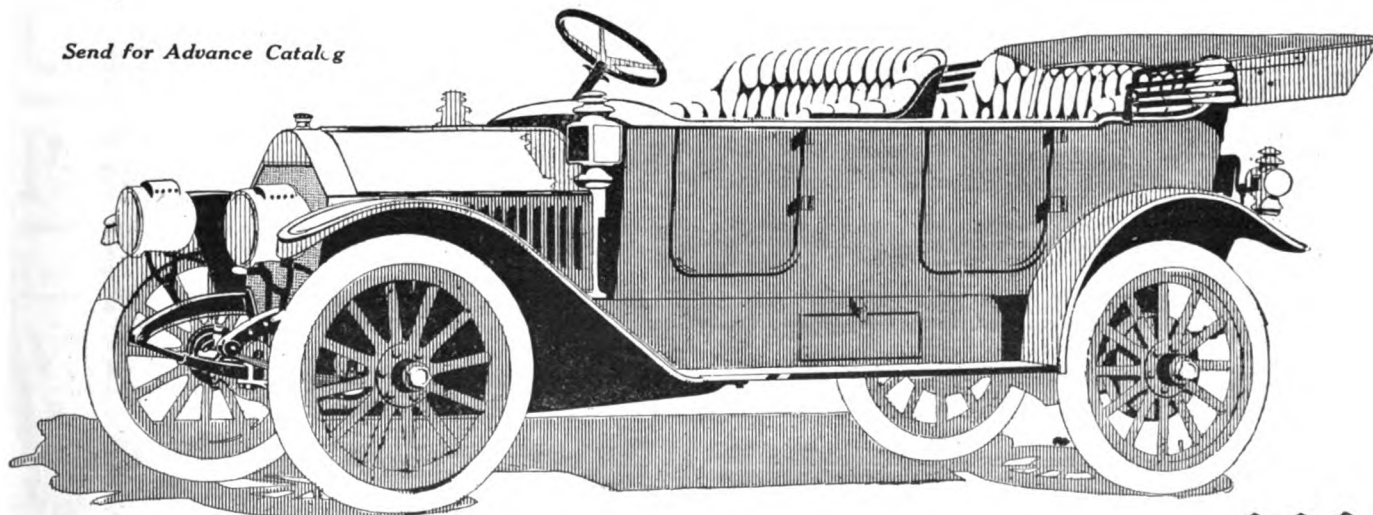
By the use of our Free Inspection Service, you reduce trouble and repair expense to a minimum.

This monthly inspection service is in addition to the Company's warranty against defective material and workmanship, as published in our catalog.

We care for your car wherever you are

Maxwell

Send for Advance Catalog



Maxwell-Briscoe Motor Co. Broadway at 61st St. New York

Division of UNITED STATES MOTOR COMPANY



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TRADE MARK.



The Oil That Saves the Motor.

AUTOLINE is made from selected Highest Grade Pennsylvania Crude Oil, it is filtered through bone-charcoal, and it produces a minimum amount of carbon. A Trial will Prove it.

GREASE-JOURNAL COMPOUND-GRAPHITE GREASE
For Transmission and Gear Lubrication

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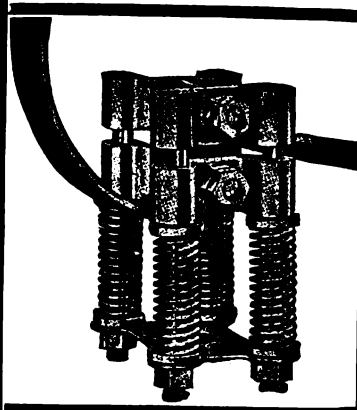
BRANCHES: — New York, Philadelphia, Boston, Chicago, Pittsburg, Cincinnati, Indianapolis, Terre Haute, Savannah, Charlotte, Knoxville.

Write immediately for literature giving full particulars.

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WHY NOT

Make your car ride as easily as a Velvet Cushion ALL THE TIME. Velvet Springs make rough roads smooth, and absorb the jolty, irritating, joggly motion, caused by cobble stones and rough roads and by stiff auto springs, or springs which are too resilient.



Velvet Springs prolong the life of your car;—the tires;—the engine;—and all working parts, and will pay for themselves in a few weeks.

You can attach in a few moments. They allow no side sway. No machine work or fittings needed;—strong, durable, cannot twist out of shape.

In writing give name of car;—weight;—width of spring;—and size of spring bolts.

Special Offer—You Take No Chance.

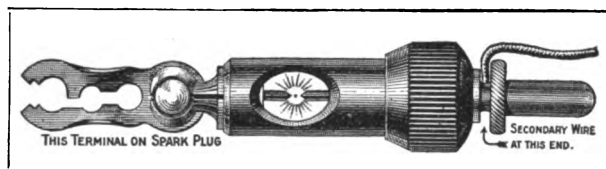
You can send remittance, use for 15 days, and if not satisfactory, return and get your money. **WRITE NOW** for prices.

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JOHN W. BLACKLEDGE MFG. CO.,
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PUT THIS ON YOUR ENGINE



It will locate ignition troubles at once and increase your engine **EFFICIENCY**. A **PHELPS TROUBLE FINDER** doubles the joy of motoring by halving motor troubles. It frequently quadruples the life of the spark plug and increases the intensity of the spark.

A **PHELPS TROUBLE FINDER** on each spark plug shows, at a glance, just how the plugs are working or not working and locates the skipping cylinder. It burns off much of the carbon on the plug and so gives you cleaner, longer-lived and more efficient plugs—hence better ignition.

The spark in the **PHELPS TROUBLE FINDER** is always visible yet perfectly protected from the atmosphere and gasoline fumes, thus preventing danger of fire or invalidating insurance.

Thousands of users now endorse the **PHELPS TROUBLE FINDER**. Attach a set to your spark plugs and leave them there. They outlast the motor, are always on the job and save you many times their cost in real money.

You need one for each spark plug on your car. Fill in this order and mail **TO-DAY**.

NEW ENGLAND EQUIPMENT CO.,
Warren Chambers, Boston, Mass.

Gentlemen:—Please send me, postage paid,..... Phelps Trouble Finders at \$1.00 each. Enclosed is \$..... to pay for them. It is understood that you are to refund this money, upon return of goods un-injured, if they fail to do what you claim for them.

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STREET.....

CITY AND STATE.....

It's the Little-Blue Spark

the Chug, Chug and Never-a-Miss That Ends Your Spark Troubles

Make of car—magnificent motor—help, of course, but it is the absolute infallibility of the spark-plug that "gets there." You can have spark plugs which you can just put into your motor and forget—the kind that never short—never sputter—never make trouble—by ordering, from your dealer, a set of

Never-Miss Spark Plugs

One Dollar - Any Type or Size

Built by men whose "know how" ends your spark troubles. They have made good for seven years. Over a million and a half satisfied users. Magneto, Regular or Extension Type, open end, Mica or Porcelain.

Guaranteed One Year

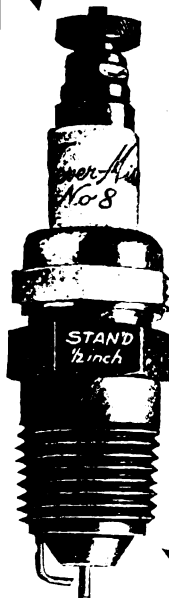
We authorize any jobber or dealer to replace any defective Never-Miss Plug or broken porcelain, within one year of purchase, and charge it to us, no matter where bought. This means absolute satisfaction.

Booklet on Request

To Dealers Everywhere

Not to handle Never-Miss Spark Plugs is to miss a genuine live-wire connection. Write today for proposition.

Never-Miss Mfg. Co., Inc.,
Lansing, Mich.



\$1

At All Live Dealers

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Here's Mighty Good News



SHOCK ABSORBERS INSTALLED FREE

Can you ask for anything more? It has cost us thousands of dollars to inaugurate this great CONNECTICUT INSTALLING SERVICE. We are making it possible for EVERY motorist to buy CONNECTICUT Absorbers and have them installed without cost. The remarkable demand for CONNECTICUT ABSORBERS has made this necessary.

This absorber is sweeping the field, because it is perfectly designed, made of the very best of material, and all motorists will appreciate the fact that it is installed on their cars without trouble, cost or bother.

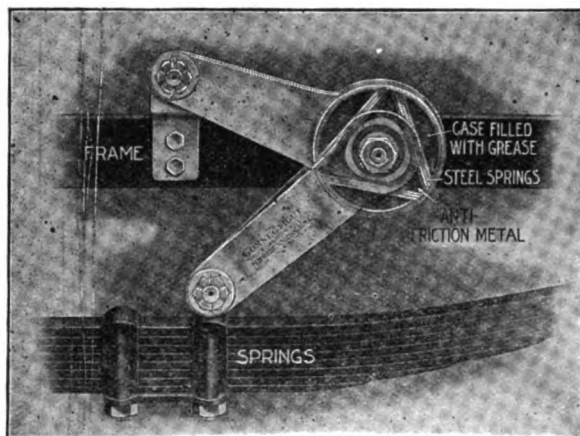
Send us the model, year, make and weight of your car and we will tell you just where to go to have YOUR CONNECTICUT Absorbers installed free of charge.

WRITE FOR CATALOG No. 18

Connecticut Shock Absorber Co., Inc.
7 Britannia Street, Meriden Conn.

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12 S. Eighth St., Minneapolis, Minn.
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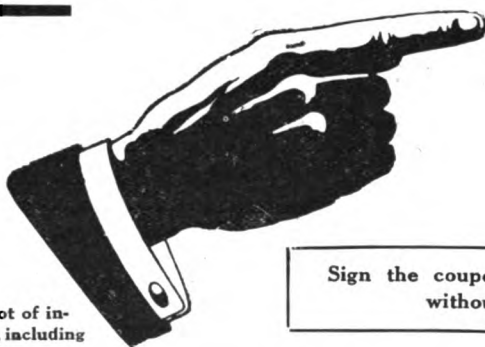
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All You Need to Repair the Worst Puncture

\$1.00 COMPLETE



And do it instantly—for M. & M. Cement is instantaneous—positive—and self-vulcanizing. No waiting—steam and electric vulcanizing is old-fashioned and too slow for repairing punctures.

M. & M. is easy to use—on the road or in the garage.

Let us prove to you that M. & M. has qualities peculiar to itself—one of which is that of satisfying users.

M. & M. costs no more than uncertain brands, and will repair punctures quicker and better than the so called "Just as Good" variety, and you take no chances of injuring the tubes.

We certainly feel proud of the fact that we have imitators—for the best is always imitated.

The Superiority of M. & M. has made it the Standard Brand to the motorist.

It has—and always will give those satisfying results.

Insist upon M. & M. the next time you are in need.

Sold by all jobbers and most dealers, or if your dealer does not handle it, sent direct, express prepaid.

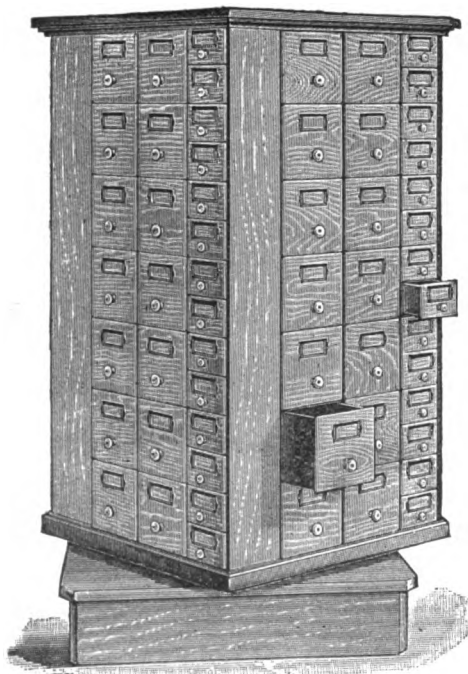
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THE M. & M. MFG. CO., Akron, Ohio.

P. S.—We are manufacturers of the famous *Knead-It*, for filling up those dig-outs in your casings—*It stays put*. 50 cents a can.

Revolving Cases.

OUR NEW CASE.



Square Drawers, from $2\frac{1}{4} \times 3\frac{1}{2} \times 4\frac{1}{2}$ to $5\frac{1}{2} \times 5 \times 13\frac{1}{2}$.

No manufacturer, dealer or repairer of Automobiles should be without our Cases. They occupy but a small space and their capacity is very large. The Drawers are locked in the Case so as to prevent their removal. Every Case guaranteed. Made for Screws, Bolts, and other small articles. Made in various sizes.

Catalog sent on application.

AMERICAN BOLT & SCREW CASE CO.,

Dayton, Ohio.

ATLAS CHAINS

by reason of the superior quality of the metal entering into their composition—and by reason of their peculiar construction, are as far in advance of the ordinary chain as the automobile is ahead of the bicycle.

Atlas Chains are made of high carbon steel. The center members (which take 90 per cent of the wear) are of drop-forged steel.



Atlas Chains are positively guaranteed to outlast three pair of ordinary chains—they are also guaranteed to never cut, bruise or in any way injure the tires.

If your car is not equipped with Atlas Chains then you are losing money both in chain and tire depreciation.

Do not delay but investigate this anti-skidding device and make it prove its own worth.

Atlas Chains give satisfaction to both the dealer and the user.

Write to-day for catalogue.

ATLAS CHAIN COMPANY

Bush Terminal No. 24

Brooklyn, N. Y.

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Did you know that Welding Repair Work required more thought than any similar line of engineering?

It seems simple enough to melt the edges of a crack together by means the Electric Arc or the high temperature Oxy-Acetylene Flame.

BUT

We as Engineers have spent almost four years studying and experimenting.

The welding is simple enough, but the weld must contract, and unless the cylinder or crank case has received just the proper treatment it will be warped or there will be shrinkage strains that may break it again in the future.

THEN WHY

Will you send your expensive automobile parts to some welding company whose only virtue is that its founders have had money enough to buy a welding plant?

The cost of the best welding plant is not 1/10th of what we have spent on experimental work.

We have built our business by satisfying every customer; moderate prices, good workmanship, promptness in delivery, and a guarantee that never ends.

We Solicit Your Patronage.

Sales Agents for the
Best and Simplest
Welding Plants.

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JERSEY CITY, N. J.

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Give Your Auto-Top a Bright, Clean New Appearance

FELTON-SIBLEY "EVERNEW" AUTO-TOP DRESSING

Will make it weather-proof, sun-proof, and last longer. It will make it glisten like new. Easily applied, dries quickly and can't injure the finest top. Made in 8 standard colors—special shades to order. Send now for color card and prices.

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"Evernew" Auto-Top Sizing for first coat on mohair cloth or canvas tops that have never been painted.
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The Best Auto Brake

is only as good as its lining. Impartial tests have shown that brake linings made of vegetable and organic substances will not lock the wheels of a car in less than 12 to 25 feet, and that J-M Non-Burn Brake Lining locks wheels almost instantly. Frictional heat burns the life and efficiency out of most brake linings.

J-M Non-Burn



Brake Lining

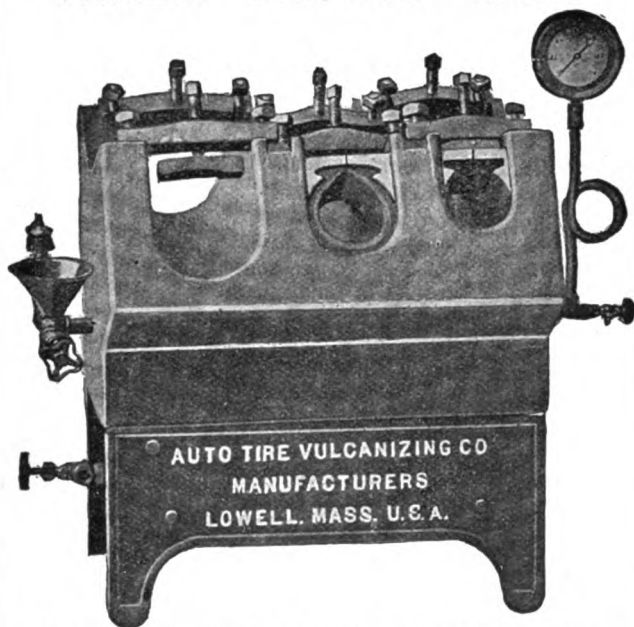
being made of the mineral—Asbestos—is unaffected by heat, gasoline, oil or water. Nothing injures it and it outwears all other brake linings, giving maximum efficiency to the end.

Send for Sample and Book, "Practical Pointers on the Care of Automobile Brakes," the autoist's handbook on brakes.

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Our New No. 8 Adjustable Sectional Vulcanizer With Three Cavities



As a Progressive Business Man you should by all means use, handle or recommend our

New Improved Auto-Tire VULCANIZING MACHINE

simply and solely because it is the best there is in Vulcanizers at any price and because the price isn't much, the operation is easy and profits are exceptionally large.

Our machine is different, far better and more economical in operation and investment cost than any other made. In all features it is so superior to all other devices there is hardly a comparison. We have some facts that will interest you and that will put you in the way of big profits. In your own interest, get posted—Write to us to-day.

Auto-Tire Vulcanizing Co., Lowell, Mass.

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Marks a discovery in methods of working Aluminum.

IT IS AN ALLOY OF ALUMINUM

You can do as satisfactory work with this solder and a soldering iron as you could with an Autogenous Welding Outfit, with no danger from expansion cracks from the excessive heat in welding.

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We Manufacture all kinds of Brazing, Welding and Soldering Fluxes, Solder Spelter, etc.

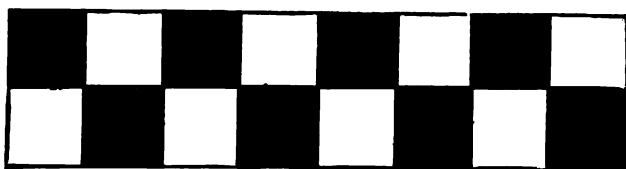
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Urbana, Ohio

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Panhard Oil is sold in "Checkerboard" Cans or in Bulk.

Don't merely ask
for "good oil"



Say:

PANHARD OIL

to the dealer

Its power to **protect** the engine parts is why PANHARD OIL prolongs the life of the motor. This is why PANHARD OIL is so valuable as a **perfect** friction-overcoming lubricant.

PANHARD OIL is refined from the best oil in the world—Pennsylvania crude. It is always the same—every drop absolutely uniform. Filtered just enough to remove all free carbon, but not excessively filtered; **has a perfect lubricating body**. Will not carbonize if properly used; and holds its body always.

It is **best** for the owner—therefore **best** for the dealer. And as the dealer is known by the goods he sells—the best trade soon picks out the best dealer.

Write for my booklet, "Motor Lubrication."

GEO. A. HAWS, 67 Pine St., New York

Dealers, write for "help sell" plan.



TIRES. TUBES. TIRES.

STANDARD MAKES.

Highest grade stock, comprising of the best manufacturers. Cannot advertise names on account of the reduced prices we are selling them at.

Every tire is guaranteed brand new, perfect in every respect, and are not more than six months old. Some of these have the names of the makers on and others are buffed.

We thoroughly examine and test every tire and tube under heavy pressure to detect any weakness before shipping.

These are not the kind usually advertised. Nothing but the best stock is quoted in this ad.

Casings to fit Clinchers, Quick Detachable or Dunlop Straight Side Tires.

Size	Casing	Tube	Size	Casing	Tube
28x3	\$9.50	\$3.50	35x4	\$22.00	\$5.25
30x3	10.75	2.75	36x4	19.50	5.40
32x3	10.50	3.00	37x4	22.50	5.75
28x3½	12.00	3.00	32x4½	20.00	5.50
29x3½	14.50	3.15	38x4½	28.00	5.60
30x3½	14.50	3.75	34x4½	23.50	5.75
31x3½	15.00	3.75	35x4½	24.50	6.00
32x3½	15.00	3.90	36x4½	25.00	6.10
34x3½	15.75	4.15	37x4½	25.00	6.20
36x3½	15.00	4.25	34x5	30.00	6.00
30x4	16.50	4.60	35x5	25.50	6.25
31x4	17.00	4.75	36x5	26.00	6.50
32x4	17.50	4.90	37x5	28.00	6.75
33x4	19.00	5.00	37x5½	30.00	7.00
34x4	19.50	5.10			

Take advantage of these prices while they last, as we cannot guarantee how long these prices will stand good.

We guarantee these tires and tubes to be strictly 1910 and 1911 goods.

We are one of the oldest and largest tire and mail houses in the United States, and you do not have to hesitate to send us an order with cash accompanied, as we can refer you to any Commercial Agency or Bank in New York, as to our references.

We agree to refund your money if goods are found unsatisfactory upon receipt.

We Ship Goods Subject to Examination.

INSIDE TIRE PROTECTORS.



Prevent blow-outs, punctures, and greatly increase mileage. No need of throwing away old tires that are not worth repairing. Simply apply the inside tire protector and the old tire is given new life again and will add many miles of additional service. It covers the whole inside of casing to the head and is thus a blow-out patch extending all the way round. It is an acknowledged fact that 75% of all tires break down or blow out in the fabric before the rubber is half worn out, thus losing half the mileage. These tire protectors are made from 3 to 6 ply of Egyptian fabric, with a self-seal flap reinforcing the rim and sides, always the weakest parts. We strongly advise placing these protectors in new tires, thus keeping them sound by releasing the strain, and the earlier a tire is equipped with them, the longer its life and the greater its mileage. Tube pinches are eliminated by the use of these protectors.

Order a complete set of them and save 100% on your tire expense.

Size	Reg. Price	Cut Price	Size	Reg. Price	Cut Price
28x2½	\$4.65	\$2.40	35x4	\$7.00	\$4.90
28x3	4.75	2.60	36x4	7.75	5.00
30x3	4.90	2.85	32x4½	7.25	5.00
30x3½	5.25	3.85	34x4½	7.50	5.10
32x3½	5.50	3.55	35x4½	7.60	5.25
34x3½	5.75	3.95	36x4½	8.00	5.50
30x4	6.20	3.75	34x5	8.10	5.60
31x4	6.25	4.00	35x5	8.25	5.75
32x4	6.40	4.20	36x5	8.50	6.00
33x4	6.60	4.40	37x5	9.00	6.50
34x4	6.75	4.75	37x5½	9.25	6.75

Owing to the fact that our profits are very small, we sell for cash only, and under no circumstances otherwise.

C. O. D. orders filled if 10% is accompanied with order, to show good faith.

Send for complete list.

EXCELSIOR TIRE CO.,

1777 Broadway.

New York City, N. Y.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

WM. KNABE & CO.



Exquisite Tone,
Marvelous Durability,
Perfect Action,

are three particularly
distinguishing features of

Knabe
PIANOS

(The World's Best)

We solicit your patronage and request
a visit to our warerooms so that we may
demonstrate the above to your satisfac-
tion.

What we have to offer is of interest
and value to prospective purchasers.

Convenient Terms of Payment.

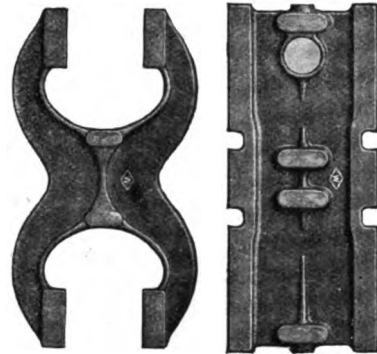
*Prospective purchasers owe it to
themselves to inspect our stock
before buying. A visit in no way
implies an obligation to purchase.*

Wm. KNABE & Co.

5th Ave. and 39th St., New York City

Established 1837

Make Precision



With light, excellently designed
and carefully wrought drop-forgings
which may be machined to a
number of measuring combina-
tions, *precision* is placed in your
hands in a way assuring unusual
advantages.

Get Circular No. 58

Finish the forgings yourselves
to your own most exacting require-
ments; if you wish directions for
hardening or case hardening, com-
mand us.

We have "Keyed these things"
up to the minute:

1. Expansion and contraction
possibilities were never better
cared for in gauge design.
2. Interchangeable work, any-
where, demands Williams' design
of Gauges.
3. Lettering panels and sides of
jaws are on same plane. Cost of
finishing operations held at lowest
point by excellence of design.
4. Peerless drop-forgings for
"Gauge Work."

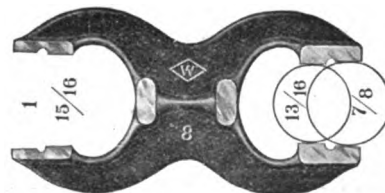
Supplied by dealer or

J. H. Williams & Co.

Superior Drop Forgings

17 Richards Street

Brooklyn, N. Y.



The special size of the measuring-jaw
or pad provides for unusual ad-
vantages; many classes of
gauges may be made from
one forging.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

No Need To Buy New Tires This Fall.



Now is the time to *re-inforce* your *present tires* so that they will be *liberally strong to last out the season*. Over 50,000 owners now have their tires re-inforced and have found it the *biggest kind of a practical success* and a big saving in money.



Interlock Inner Tires are the finest quality, heaviest and most complete re-inforcement on the market.

They are in a class by themselves, and are for the man who knows that the best always pays best in the long run. They will hold where others fail and give longest mileage. Equip all your tires if you would know real tire satisfaction and *freedom from trouble*. Do it early! The newer the tire the longer and better service.

Double Fabric Tire Co.

18 East 7th Street

AUBURN, INDIANA

Puts The Perpetual Pucker On A Punctured Radiator. Finds the leak and fixes it in fifteen minutes.

Carry it in your car

It's cheaper and better than soldering. Leading garages and dealers have it.

Price 75c. a box.

THE NORTHWESTERN CHEMICAL CO.,

Makers of "The Chemically Correct Line" of Auto Specialties,

MARIETTA, OHIO

BUY FROM US OR WE BOTH LOSE "GRIFFITH" TIRES SOLD AT 40% OFF

Have the good points of all other makes incorporated in them. We are using a much heavier fabric and an extra layer more than the other Standard manufacturers.

We are the originators of the idea of selling tires guaranteed and unguaranteed.

We represent a majority of the "Standard" manufacturers in the disposition of their "seconds" and special job lots, to whom we refer you.

CLINCHERS, DUNLOPS, Q. D. CLINCHERS.

Size	Our Unguaranteed	Our Guaranteed	Standard List
28 x 8	\$10 87	\$18 85	\$14.50
30 x 8	12 93	15 15	15.50
30 x 8 1/2	16 81	21 75	22.85
32 x 8 1/2	18 83	28 10	24.40
34 x 8 1/2	19 70	26 27	26.55
36 x 4	20 88	27 18	32.80
38 x 4	21 74	28 98	35.30
34 x 4	28 77	31 69	37.75
36 x 4	24 71	32 94	40.25
34 x 4 1/2	29 00	38 66	47.85
36 x 4 1/2	30 67	40 90	50.75
38 x 5	34 67	46 23	62.80
37 x 5	35 86	47 14	64.00

WRITE FOR PRICES OF OTHER SIZES.

Tubes.

"Independent" 30% off. Job lots of Standard makes at 40% to 60% off. Q. D. flaps \$1.00 extra. Goods shipped with privilege of examination. Money refunded on goods returned intact within a week.

AUTOMOBILE TIRE CO., Inc.

ED. C. GRIFFITH, Pres.

Tel. Col 8886.
Cable, Autotires.

1625 Broadway, New York City

The Oldest Auto Tire Jobbing Concern in the U. S.
and Largest in the World.

Hess Brights HB DWE

The Highest Priced Ball Bearings

— and worth it

HESS-BRIGHTS interchange with most other makes. Write or wire to the nearest distributor, specifying the trade-mark letters and size numbers of the bearings you wish to replace.

Retail Distributors of Ball Bearings:

NEW YORK CITY, The Hess-Bright Co., 1974 Broadway.
CHICAGO, ILL., The Hess-Bright Co., 1800 Michigan Ave.
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WORCESTER, MASS., The Post & Lester Co., 12-14 Mechanic St.
SPRINGFIELD, MASS., The Post & Lester Co., 125 Bridge St.
HARTFORD, CONN., The Post & Lester Co., 175 Asylum St.
NEW HAVEN, CONN., 1085 Chapel St.
BRIDGEPORT, CONN., 278 Fairfield Ave.
PORTLAND, ME., Maine Motor Carriage Co., 43 South St.
TRENTON, N. J., J. L. Brock.
WASHINGTON, D. C., Auto Livery Co., 212 13th St., N. W.
DENVER, COLO., Auto Equipment Co., 1518 Broadway.
SAN FRANCISCO, CAL., Chanslor & Lyon Motor Supply Co., 501-7 Golden Gate Ave.
LOS ANGELES, CAL., Chanslor & Lyon Motor Supply Co., 945-7 S. Main St.
FRESNO, CAL., Chanslor & Lyon Motor Supply Co., 1246 J. St.
SEATTLE, WASH., Chanslor & Lyon Motor Supply Co., 916 E. Pike St.
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The **HESS-BRIGHT** MANUFACTURING CO. 2119 Fairmount Avenue PHILADELPHIA, Pa.

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THE GARAGE BEAUTIFUL
JUST AS EASILY BUILT RIGHT AS WRONG
AND A GREAT DEAL CHEAPER TOO IF YOU GET OUR
FREE WORKING PLANS



ALTHO not in the Garage Building, Selling or Planning business, our wide experience in the exclusive equipment business has led us into every quarter of the globe where we have consulted the world's greatest architects, solving some of the most difficult problems, in providing shelter for one or any number of Motor Cars, AT TOTAL BUILDING COSTS FROM \$35 TO \$3500. We carefully compiled this valuable data on account of its rare educational value in this comparatively new field, and while the work could not possibly be duplicated under an expenditure of Thousands of Dollars, we will distribute this entire work, together with one complete set of the Garage Beautiful, WORKING PLANS ABSOLUTELY FREE OF COST to all active or prospective Motorists who are willing to pay for the mailing expense ONLY TEN CENTS, coin or stamps. These Working Plans are complete in every detail and designed to meet a flexible range of requirements both as to size and building material to be chosen, from a construction of wood siding to concrete, at cost estimates to correspond. Our one and only object in doing this is in hope of incidentally acquainting you with our equipment for present or future emergencies, and the expense of this FREE offering will be charged to our advertising account. Understand, we make this unprejudiced gift absolutely with the fame of our name at stake, and in no way further obligate or annoy you, as we are not in business for such purpose. To any one unable to fully appreciate the value of this exclusive set of plans, worth alone Twenty-five to Fifty dollars, to say nothing of the INNUMERABLE OTHER PLANS SUGGESTED, we certainly prefer your returning them to us so we can give back your Postage Money at once and send plans to another applicant, as our supply, or sincere motive, will not justify a waste.

Pitless Auto Turntable Co.

1501 GRAND AVENUE
KANSAS CITY MISSOURI

References As to our reliability and standing ask any Bank or Commercial Agency in Kansas City



Reliance

(REG. U.S. PAT. OFF.)

No matter what car you drive, Reliance Spark Plugs will improve its service—add to its power.

This statement is backed by these four indisputable facts:

Reliance Spark Plugs give a hot, concentrated spark. Take less battery power than any other plug. Are absolutely proof against soot or carbon. And, the Porcelain won't crack from heat.

Isn't it very important to you to know these statements to be facts? They are easily proved—you run no risk; simply equip your engine with Reliance Spark Plugs. Get them from any first-class dealer or jobber, and if you find that the plugs do not suit you—do not live up to the claims made for them—get a new plug—or your money back without argument. The strongest, fairest, broadest, iron-clad guarantee ever written.

Regular Type, \$1.00

Magneto Type, \$1.25

PLATINUM-IRIDIUM ELECTRODE

Sparks in Water

Jeffery-Dewitt Company
53 Butler Ave., Detroit, Mich.
Armand Frey & Co., Agents for Continental Europe, Berlin, Germany





GET BIGGER PROFITS IN THE REPAIR BUSINESS

EVERY auto owner must have his tires repaired every little while. Punctures, tears, and blow-outs are bound to happen somewhere in your community every hour of every day. The automobile with bad tires is worse than useless till repairs are made. Owners pay big prices to get this work done **without delay**. You can do it quickly and make \$15 to \$20 a day with the

SHALER Vulcanizer

Electric or Alcohol Heated

The **Shaler** is the one perfect vulcanizer—easy to handle, does its work quickly and alone. Needs no attention—while one job is vulcanizing, another can be prepared. Will not undercure; cannot burn. Makes a perfect weld—mends any tire trouble in inner tube or outer casing and makes a smooth, clean job. The tire need not be removed from the wheel to repair casing. Has big capacity for work and **will pay for itself in a few days**. Uses direct or alternating current—also types for alcohol. Costs but $\frac{1}{2}$ c per hour to operate. Sold under absolute guarantee.

Send For Free Hand Book

Tells all about the **Shaler** and its money making possibilities for you. Free if you write today.

C. A. SHALER COMPANY

807 4th Street - - Waupun, Wis.

Smaller outfits for individual auto owners.
Send for Booklet.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

AUTO CASINGS AND TUBES—Fresh Stock

Maple Grove Farm,
Underwood, Minn., July 7, 1911.
Wm. Vanderpool, Springfield, Ohio:
Dear Sir—I find your rubber goods
just as good as those I have been
paying twice the price for.
(Signed) OSCAR SWANSON.

Thornton, Texas, March 13, 1911.
Wm. Vanderpool:
Dear Sir—Please quote prices on
your tires. Dr. Bass of Barry, Texas,
recommends them very highly. I
want to try them. My wheels are
28x3½.
Yours etc.,
(Signed) W. A. BEDFORD, M.D.

Versailles, Ky., Mar. 15, 1911.
Mr. Wm. Vanderpool:
Dear Sir—You see I am back again
this season looking for good casings.
Kindly send me your prices on 32x3½
casings and any others you are selling.
Yours respectfully,
(Signed) DR. S. A. BLACKBURN.

	CASINGS		TUBES		Re liners	By Mail add
	Guaranteed	2nd Quality	Guaranteed	By Mail add		
28x3	\$9.50	\$8.75	\$2.75	\$0.27	\$2.75	\$0.33
30x3	10.00	9.75	2.85	.28	2.85	.34
30x3½	14.25	11.70	3.75	.42	3.40	.37
32x3½	14.75	13.00	4.25	.48	3.50	.39
34x4	22.25	19.50	5.75	.....	4.80	.53

Clincher and Dunlop.
Guaranteed Motor Cycle Cases and Tubes.
Single clincher only. Bally Type tread.
28x2½ case, \$7.75; tube, \$2.50; by mail, \$2.65.
28x2½ case, \$8.30; tube, \$2.65; by mail, \$2.82.

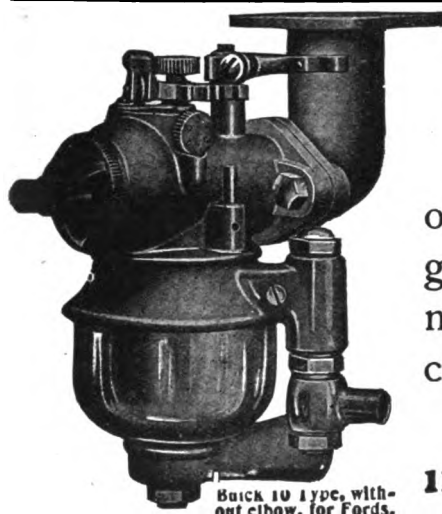
Send for price list on all size Cases, Tubes and Re liners. On receipt of 10%
I ship, allow examination. Many have re-ordered. If you order a Tube or
Re liner and want it sent to you by mail, send Post Office Order for total
amount.

WM. VANDERPOOL
SPRINGFIELD, OHIO

Buckeye City, O., March 24, 1911
Mr. W. Vanderpool:
Dear Sir—Please send me your net
price on 28x3 Q. D. Clincher. I bought
from you last year which gave good
satisfaction. Wishing early reply.
Very truly,
(Signed) D. L. SWARTZ.

Keokuk, Iowa, June 17, 1911.
Wm. Vanderpool, Springfield, Ohio:
Dear Sir—We purchased two casings
from you July 15 last year, 3x28. They
have given satisfaction and we would
like to ascertain what your price is at
the present time. Hoping you will
give the above prompt attention, we
are
Respectfully yours,
(Signed) PRICE BROS.

Franklin, Tenn., April 14, 1911.
Mr. Wm. Vanderpool:
Dear Sir—Kindly send me one inner
tube 34x4, for a 1905 Clincher rim, by
express C. O. D. at once. I bought
one of your cases last year and it has
been very satisfactory. Kindly hurry
this off. Yours very truly,
(Signed) C. B. PENNOCK.



Special Heitger Carbureters for Small Cars

Made of Aluminum, nickel plated, heavy glass
or metal float bowls, separate adjustments for
gasoline, on high and low speeds, giving maxi-
mum speeds, fine control, minimum gasoline
consumption. Special types for Motorcycles also.

HEITGER CARBURETER CO.,
1170 Beecher St., Indianapolis, Ind.

AUTOMOBILE

Bodies, Chassis,
Wheels, Steer-
ing Devices, front and rear Axles, Steel
Rims, etc.

GET OUR PRICES AT ONCE.

BORBEIN AUTO CO.

2109-2111 N. 9th Street,
ST. LOUIS, MO.



BATES'

The World's
Contains no
acids



BEFORE

Will not injure the
most delicate
skin.

GRIT

Greatest

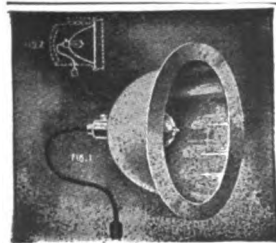
SOAP

Hand Cleaner



AFTER

BEWARE OF IMITATIONS
Manufactured only by
HOWARD M. BATES CO.
1140 Fairmount Ave., Phila., Pa.
Free Samples Mailed on Request.



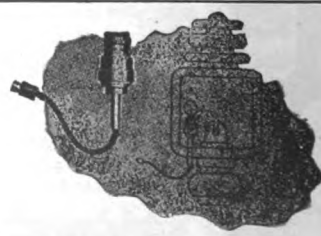
They are DANGEROUS and DIRTY

Why Not Change Your GAS and OIL LAMPS to

ELECTRIC

Ask for Booklet No. 3—it tells you all about it.

GUIDE MOTOR LAMP MFG. CO., Cleveland, Ohio, U. S. A.



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BULLET PROOF INNER TUBE PROTECTING WEBBING

Tough as old oak, flexible as a glove

HERE is the simple, *logical* way of eliminating punctures and blow-outs. A heavy woven webbing slipped between inner tube and casing, and held in place by pressure—no bias places to pinch—will not heat—conforms to shape of tire. *"Just as if the inner tube were that much thicker."*



1 Shows nail striking webbing. 2 shows webbing turning nail.

Fine for the garage man, as Bullet Proof may be purchased in rolls and cut as required.

Delivered direct to any address, charges paid, on receipt of price.

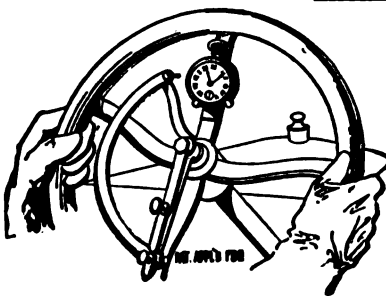
PRICE FOR ONE TIRE:			
28 x 3 or 3½.....	\$1.50	3½ x 3½.....	\$1.80
30 x 3½.....	1.60	3½ x 4.....	2.43
32 x 3½.....	1.70	36 x 4.....	2.57

Send for Booklet No. 2



WABAN WEBBING CO., 104 Essex Street, BOSTON, MASS.

Know the time all the time when driving Get the **Time Clutch**

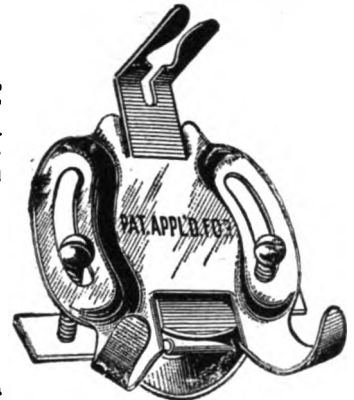


It keeps the time of day right where you can see it without taking your eyes off the road for an instant. It can be attached to any steering wheel and takes any man's watch. Watch can be inserted and removed instantly. Let us send you one and if it is not satisfactory, return it and we will refund your money.

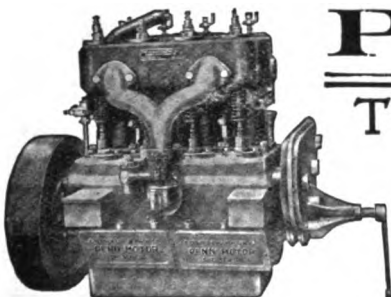
TIME CLUTCH: Nickel, \$1.00. Polished Brass, \$1.00. Gun Metal, \$1.50.

VIBRATION-PROOF WATCH: Guaranteed for one year: Nickel, \$1.50; Gun Metal, \$2.00. Sent postpaid on receipt of price if your dealer cannot supply you.

THE STERLING MFG. CO., Inc., Staunton, Virginia



PENN MOTORS



THIS construction enables us to build the lightest, most compact and durable motor on the market.

Large Valve Areas and short lifts add to the power as well as the quiet running. Crank-shafts of the suspended type.

Motors are equipped with a self-contained oiling system, and all parts are interchangeable and accessible.

Large Water Jackets, circulation being complete around cylinders, and valve chambers of sufficient area to make possible to run either by forced circulation or Thermo Syphon.

TWO TYPES } 20-24 H. P., 4-cyl., 3½-in. bore, 4½-in. stroke.
30-34 H. P., 4-cyl., 4½-in. bore, 4½-in. stroke.

Write at once for catalog giving full particulars.

Manufactured by CHESTER ENGINEERING & MACHINE COMPANY, Chester, Pa.

NEW ELEKTRON AUTO HORN



This new Elektron Horn was designed to meet the demand for an attractive, durable and effective Auto Horn. The tone is of a clear, clarion type, sharp and penetrating, BUT NOT HARSH. We have placed the price within reach of all and at the same time produced a first-class horn in every respect. Operated on four or five dries or six volt storage.

Sold at low price. We can surely interest you. Write now for price and particulars. We have many other styles of horns. Get our printed matter.

THE EDGAR MFG. CO., 104 H. Hanover St., Boston, Mass., U. S. A.

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THE PUNCTURE INDICATOR.

It is as important as the tire itself. The price, 75 cents, places it in reach of everybody. It is easily attached, and gives instant warning of Punctured Tire, thereby preventing riding any distance on Flat Tire.

Ask your dealer or write for descriptive circular.

Sole Authorized Manufacturer
BALTIMORE AUTO. SPECIALTY MFG. CO.,

506 and 508 M. & M. Building,
Baltimore and Sharp Sts., BALTIMORE, MD.

WELDING AUTOMOBILE PARTS



Cracked or Broken

Cylinders, Crank Shafts,
Crank Cases, Housings, Frames,
Axles, any metals of any shapes or
thicknesses, including

ALUMINUM PARTS

All work
absolutely
GUARANTEED

Manufacturers of welded (seamless) gasolene and oil tanks.

Write for estimates.

We also manufacture the only Oxy-Acetylene Welding Apparatus
allowed by the Underwriters Laboratories in insured buildings.

Western Welding & Mfg. Co., 557 & 559 W. Jackson Boulevard, Chicago, Ill.

Brown Impulse Tire Pump

PRICE \$15.00

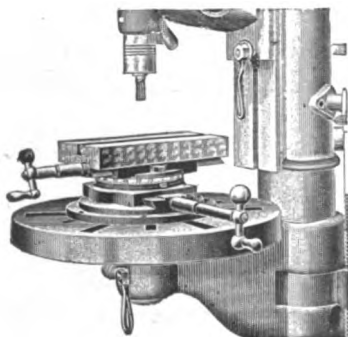
Including—12 feet of hose, high
grade recording gauge, and self-
opening valve connection.

Don't pump your tires in the
old way. Let your motor do the
work. Simply insert pump in
place of spark plug and run
motor on low throttle. With
one pump you can fit any car.

Let us send you our leaflet
that tells how.

THE BROWN CO.
1100 S. Clinton St.
Syracuse, N. Y.

THE DAVIS MILLING ATTACHMENT AND COMPOUND TABLE



Has Circular Base for clamping to
any Drill Press Table, with Dove-
tail Cross Slides, operated with
Screws and Ball Cranks, by hand.
Saddle is graduated and swivels to
any angle. Table is slotted for
clamping down work, Chuck or
Vise. Handy for large shops, when
the big machines are tied up, for
spotting castings, milling off ends
of busses etc; for small shops that
cannot afford expensive machines;
diemakers, locksmiths, pattern-
makers, repair men and automobile
garages. It will cut key seats and
mill cams. For use with end mill,
fishtail cutter or formed cutters.

Write for Price.

MANUFACTURED BY

THE HINCKLEY MACHINE WORKS, Hinckley, Ill.

THE GENUINE MAHER DUPLEX MULTI

Only Genuine Self-Cleaning Spark Plug on the Market

See what other people say:



Racine, Wis., June 26, 1911.

My dear Mr. Hanson:—

Per promise will report to you on the Devil's Lake spark
plugs. I have run my car 1200 miles since I put them in, and
yesterday took them out to see what condition they were in
and found they are as clean as a hound's tooth. The plug is
all right.

Respectfully,
(Signed)

R. B. COLEMAN,
General Manager of Collectors,
J. I. Case Thresher & Auto Co.

N. B.—"This ad. is worth \$0.75 per plug up to six plugs, when
sent in accompanied by 50 cents for each plug ordered."
(List price \$1.25.)

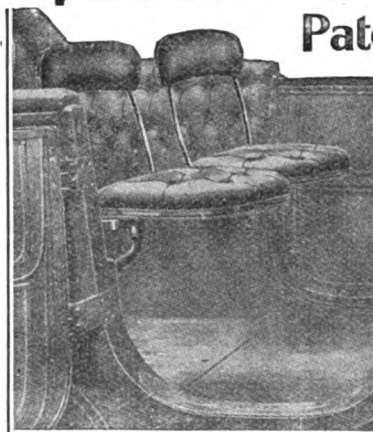
Write for Dealers' Discounts

THE DUPLEX MULTI-SPARK PLUG CO.

DEVIL'S LAKE, N. D.

Pat. Feb. 7, 1911

Patent Luxury Folding Seats



Made from steel drop
forgings; artistic in
design and finish;
compact, rugged and
durable.

A necessity of high
grade car equipment.

Write for catalog show-
ing various models.

Graves & Congdon Co.
AMESBURY, MASS.



The Geysco No Cement Patch

For Patching Inner Tubes.

Requires No Cement or Acid
to Patch Punctured Tubes.

The patches are the best and most practi-
cal on the market and by their use the patch-
ing of holes in the inner tube can be accomplished in but a very few minutes.

Only a few drops of gasoline need be used to prepare the patch for the tube.
Geysco No Cement Patches are especially made of the very best Para
rubber and unlike most patches using the regular cement they do not work
loose when the tire becomes heated.

The patches must first be used before their many advantages can be
appreciated. They permit of speedy work without the bother and mess of
using a cement. Eight Patches in package, containing full directions and
fine sand paper, 75 Cents. SPECIAL TRIAL OFFER, 2 Packages, \$1.00.

The Geyer Sales Company, 444 Pimm Building, Dayton, Ohio

SEAMLESS STEEL TUBING

ESPECIALLY ADAPTED TO THE USES OF

Automobile and Cycle Manufacturers

Also for a Great Variety of Mechanical Purposes

COMPLETE STOCK—ROUND AND SQUARE.

— ALSO —

COLD ROLLED BRAKE BAND STEEL

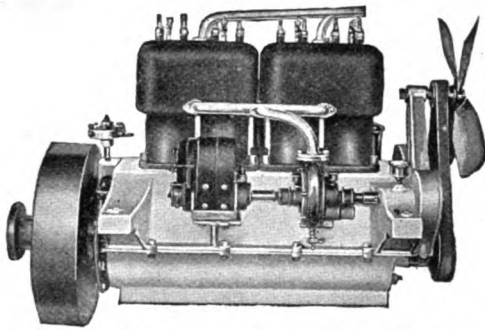
O. H. Cold Rolled Sheets, Strips for Drawing and Stamping
and Thin Sheets for Shims, Liners, etc.

EDGAR T. WARD & SONS

23-25 Purchase Street, - - BOSTON, MASS.

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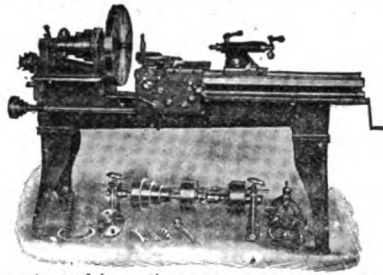


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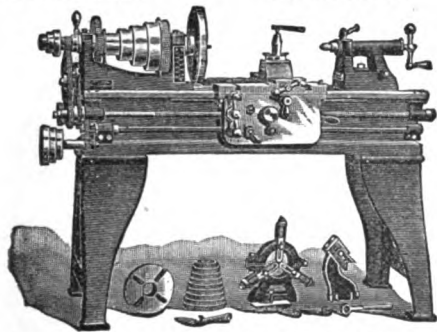
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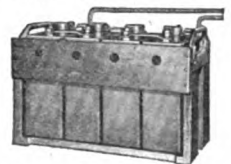
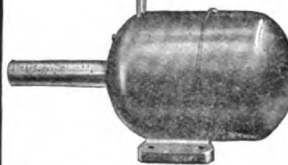
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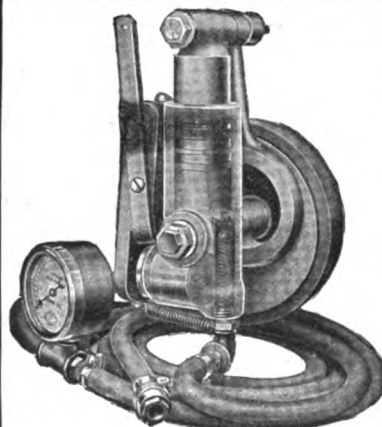
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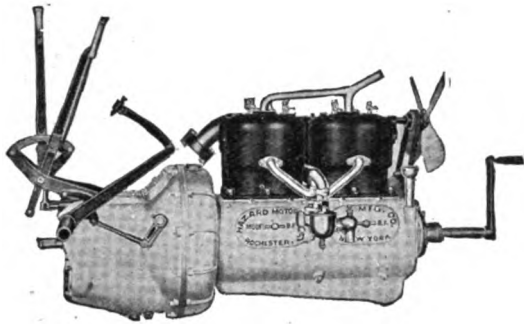
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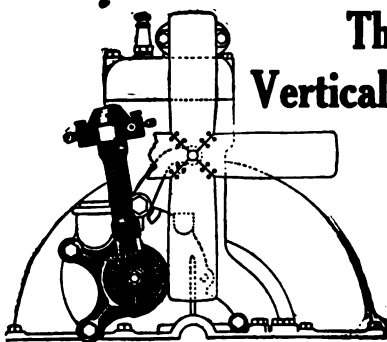
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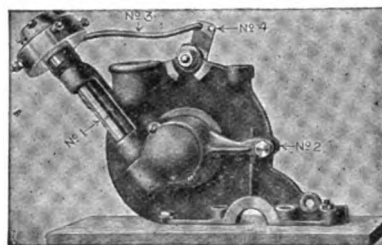


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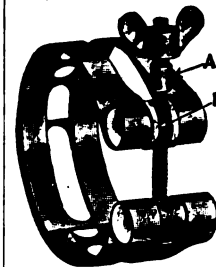
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End View, showing arrangement of electrodes, and condenser terminal.

SPARK PLUGS

WILL CURE THE "JERK" IN YOUR MOTOR.

In the "Trouble Dept." on page 60 of this issue, Mr. Chas. J. Root, of Geneva, N. Y., tells his experience with a

BUICK CAR and "BEST" PLUGS

He writes us

HIS TROUBLE

Could not throttle down without having an unpleasant "jerk," unless running 25 and 30 miles an hour.

WHAT HE DID

Wrote to every Buick owner possible, to find a remedy. Acted on every suggestion, went to great expense, employed all the expert mechanics in his town, called on the factory agents, all gave it up, nothing did any good.

HE DETERMINED

to try a set of "Best" Plugs, figuring they would cost no more, at any rate, he could be no worse off. He tried a set.

RESULT

"Jerk" gone, can throttle down to 2 and 3 miles an hour and still have power, has speed he never before realized, has speed with power on the hills he never before experienced. Gets 17.6 miles per gallon of gasoline, is now convinced of what "Best" Plugs can do.

Mr. Root has owned and driven a car since 1908 and wants every Buick owner to know what "Best" Plugs did for him.

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Spark Plugs ordered from you some time ago were especially for a Ford T car that I have been having trouble with, and in which I tried almost every plug advertised in order to find one that would not foul up so quickly.

Your Plugs gave me the relief wanted. They gave me satisfaction where others failed.

Yours truly,

(Signed) CHARLES H. GORDON.

These plugs were purchased May 31, 1910, more than a year ago.

Jersey City, N. J., July 27th, 1911.
The four (4) "Best" Plugs I installed in my Ford T car have given surprising results. 30% less gasoline and 30% more power. The plug deserves all the credit its name stands for.

Yours very truly,

(Signed) FREDERICK SCHAEFER.

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Pacific Coast Agents.

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Of course we know you do. We only put the question to attract your attention. As you do read the papers and are fully posted on everything up-to-date that is going on, we wish to remind you of the articles which are appearing constantly in reference to correct air pressure in your tires. All the tire manufacturers are laying great stress on the importance of having tires pumped to the pressure that they advise, but in order to be sure you follow their directions you must have a good Tire Pressure Gauge.



HALF SIZE.

The SCHRADER UNIVERSAL TIRE PRESSURE GAUGE

has been submitted to every tire manufacturer in this country and we have their written approval of it. In most instances they tell us they consider it the best Gauge on the market. We are making this Gauge just as carefully as our sixty-six years of experience in manufacturing brass goods has taught us and every one of our Gauges is backed by our guarantee, so if you are not satisfied with our Gauge you need not keep it.

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VOL. XI, No. 6.

NEW YORK, AUGUST, 1911.

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MOTOR CAR ENGINES.

Some of the Things That Make Them Go Wrong and How to Remedy Them.

The motor car engineer must have been in the prophetic eye of Solomon when he enunciated the proposition that "man is born to trouble as the sparks fly upwards." Even when everything is running sweetly there is always a vague wonder as to what will happen next, and the test of the true driver is, that he can handle the car as if a breakdown were impossible, and yet be ready always to put trouble right. Fortunately in a good many cases engine trouble advertises itself, to an experienced man at any rate, for a little while before the breakdown occurs, although there are cases, of course, where events happen so quickly that nothing can be done.

It occasionally happens that when an engine is called upon to pull up an incline it will not answer the throttle as it should do, and moreover a slight clicking or knocking may be heard in the cylinder. These symptoms often point to the existence of a broken piston ring, the loss of power being caused by the leakage of compression, and the knocking being due to the broken pieces of the ring. This will necessitate the dismantling the engine, and it is very inadvisable to run an engine to any great extent when it is in such a condition.

First of all, all joints such as those for the water, exhaust and inlet pipes should be disconnected from the cylinders, and on taking off the cylinder the broken piston ring will be found. This ring should be taken off and, if there are no spare rings in stock, sent away as a pattern for a new one. If this is sent to the makers of the engine it is useful to let them know in addition the series number which they have stamped on their engine and which will probably be found on the upper half of the crank-case. This will help them to supply the exact ring even if wear has taken place in the old one. When the new ring has been received, and while fitting it into the piston, care should be taken that all the slots in the ring do not come directly over one another, as otherwise there will be a leakage of compression. By placing them in different positions as far as possible from each other, any leakage from one side of the piston to the other will be stopped. When everything has been connected up again it will be found that the engine will pull better than it was doing with the broken ring, but probably not quite so well as it did under normal working conditions, as it is first necessary for the new rings to find their seatings. When they have done this, however, the engine will pull without loss of compression or knocking from this cause.

It sometimes happens that a sharp knocking is heard on the engine when it is being accelerated. This may be due to slackness in the big end, and it is advisable to adjust the big end bearing on the crankshaft. If this does not settle the trouble, the cylinder should be opened up in order to ascertain whether there is any collection of carbon on the top of the piston, and inside the cylinder head, which would reduce the clearance and

cause the hammering. If this is found, all carbon should be carefully cleaned off. If, after this treatment it is found that the engine still knocks, the trouble is probably to be found in the gudgeon pin. The cylinder should be taken off again and this pin, which holds the piston to the connecting rods, should be carefully examined to see if there is any play upon it, as this would cause a distinct knock. If there is slackness at this point the gudgeon pin will have to be renewed, and care must be taken, in making a new one, that the fit, while being a tight one should not be too tight to allow the engine to work properly. Very careful workmanship is required for this job, and only an experienced mechanic should undertake it. After the new pin has been made and the cylinder is fitted on again it will in every probability be found that the knock on accelerating the engine will have disappeared.

It is sometimes found that the engine persistently continues to knock, in spite of the above courses of treatment, the location of the knock being rather difficult to ascertain. If such a knocking which cannot be accounted for is experienced, it is a good thing to have a look at the valve tappets and see if they are adjusted as they should be. As a general rule their proper distance, when lifted, is about the thickness of an ordinary piece of writing paper, and if they are not properly adjusted it is easily seen that a considerable knock can be produced. In most cases the tappets can be taken out of the engine and adjusted, and this is by far the easiest way to do the job. Where, however, it is impossible to take the tappets out quickly and easily the adjustment will have to be effected in place, and for this purpose some very thin spanners will have to be used. When the tappets are adjusted sufficiently, it will be found on starting up the engine again that the knocks on the engine due to this cause have been stopped.

Another class of troubles which sometimes cause knocking and slow starting on an engine, are due to electric defects in the means of ignition adopted. For example, if the engine ignition is upon the battery system, it will occasionally happen that when the engine is started up it may back fire or knock when running. This is probably due to having the ignition too far advanced. On the other hand it may be found that it does not pull the car up hills as it should do, and there is reason to suppose that this is because the ignition is unduly retarded. In the first case, that of the ignition being too far advanced, it is advisable to take the cover off the contact breaker of the ignition and note the position of the blades when the piston is on the firing stroke. If it is found that the brass segment in the cam has passed over the blade, it is evident that it is too far advanced, and that, therefore, the cam will have to be moved back so as to be just forming a contact with the blade. In some cases the contact breaker is equipped with an adjustable rod, and by simply adjusting this rod the ignition can be retarded or advanced. It is evident that the same course of treatment would apply when the engine ignition is timed too slow.

There are occasions when it is desired to start up the

engine and it cannot be done in spite of all efforts. The spark plugs may have been carefully cleaned, the carburetor may have been flooded and every other device the driver can think of may have been exhausted. When this is the case it is advisable to see whether the batteries are charged or not, by testing the terminal voltage by means of a low reading voltmeter. If the cells are properly charged and the car does not start it is useful to examine the trembler on the coil as this may have become stuck. If this is the case and it requires adjusting, this can be proceeded with by taking off the screw, and the trembler blade and then getting to work with a very fine file and carefully levelling the platinum points. Care must be taken to remove only the very slightest portion of the metal. When this is done the blade and screw should be fixed up again, and the trembler should then be adjusted until the highest toned buzz is obtained from the coil. It will probably then be found that after cranking round for a pull or two the engine will start up satisfactorily.

In cases where a magneto is used for the ignition it may happen that the engine works erratically due to mis-firing. When this occurs the first thing to be done is to take out the spark plugs and clean them. If this does not stop the mis-firing it is a good thing to carefully examine the wires forming the electrical connections in order to see whether or not they are broken so as to form a short circuit. If this is not so the next step is to proceed to clean the points of the magneto which are situated in the distributor of the magneto and are fitted with platinum. The cleaning is effected with a file as described above. The adjustment can be corrected by means of the use of a special magneto spanner, and it is useful if this is made of the right thickness in one of the blades to form a gauge of the space between the two points, when they are just prepared to open. It may here be remarked that care should be exercised in cleaning a car to see that no water is allowed to get through the bonnet, as there is very great danger that it will find its way on to the magneto and thus cause a short circuit at an inconvenient time.

As regards the timing of the magneto in order to correct too fast or too slow ignition of the gas, the method of procedure is very much the same as that described in connection with the battery ignition. First of all the position of the firing cam of the magneto should be found when the piston is on the top of its compression stroke, or in other words just ready to commence its firing stroke. This determines the point at which the spark should ignite the charge of gas drawn into the cylinder from the carburetor. If it should be found that the contact is already made or is about half way over it is evident that the magneto is timed too fast, and the effect of this will be a knocking when the engine is pulling. If the contact has not come up into position it is obvious that the magneto is timed too slow. The contact, if the timing is exact, should be just forming when the piston is on top of the firing stroke. If it is found that the timing is a little too fast, it can be remedied by uncoupling the magneto from the frame of the car, which is not a difficult task in modern car constructions, and then turning the bevel wheel in the opposite direction to that in which the cam usually revolves. In order to be sure that the adjustment is exact it is well only to move the wheel one tooth at a time. It can be tried for position before coupling up, and the operation repeated until the adjustment is correct. On coupling up it will be found that the knocking which is caused by the ignition being too far advanced is remedied. If the ignition is a little too slow to start with the bevel wheel will, of course, have to be advanced tooth by tooth in the normal direction

of rotating until the timing is correct. In some types of magneto drives it will be found that a chain and sprocket is employed. In this case it is not necessary, of course, to take the magneto off the frame, but simply to take off the chain in order to alter the timing.

There are of course, many other engine troubles and their remedies which might be enumerated, but the above are sufficient for one short article on the subject. Perhaps it will be possible to return again to the subject on another occasion.

THE INDUCTION COIL.

Important Point in Connection With Its Construction —The Magnetic Circuit.

BY SYDNEY F. WALKER

Number 3.

It will be understood from what was said in dealing with batteries, that whether dry batteries or accumulators are used, it is of the utmost importance that the current taken by the induction coil, should be as small as possible. The staying power of the battery depends inversely upon the strength of the current it has to furnish. Every time a spark is called for, a current of a certain strength is called up from the battery. Hence the smaller that

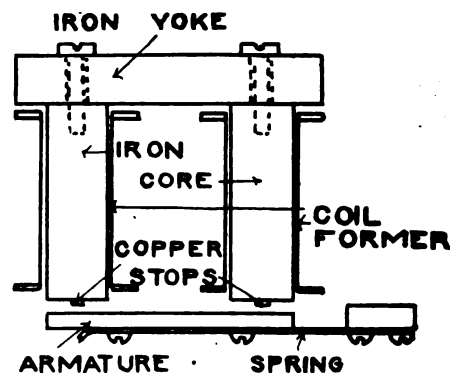


Fig. 13—Diagram showing the magnetic circuit of an electric bell.

current, the better. In the latest forms of induction coil, the current taken has been considerably reduced. A little while ago the standard was 1 ampere; now coils are on the market, in which currents of .2 and .3 of an ampere only are taken. Probably reducing the current by 2-3 would increase the useful life of the battery, whether dry cells or accumulators, by considerably more than four times. In addition to this, all electro chemical actions go on better, when the electric currents are comparatively small.

One of the things, therefore, that the writer would advise makers of automobiles to enquire into, and to test for themselves, is the current taken by the induction coil, where an induction coil is employed, for each spark. The point that was mentioned in a previous portion of these articles, the additional pull upon the battery with the increased number of cylinders, will be seen to have a most important bearing upon this question of the current. A battery that, when furnishing 1 ampere for a two cylinder engine say, worked satisfactorily, would probably run a six cylinder engine equally satisfactorily, if the working current had been reduced to 0.3 of an ampere.

Fig. 14 is a diagram, showing how to test an induction coil, to know the current required. When testing, the spark plugs should be in the cylinders and the actual conditions of running observed as closely as possible.

The construction of induction coils, so far as economy

in current is concerned, appears to the writer not to be as well understood as it should be. It appears to him that the principles of the transformer, and by which the efficiency of the transformer has been so much increased, should be applied to the induction coil. As a matter of fact, while the efficiency of modern transformers, under favorable conditions, is over 90%, that of induction coils

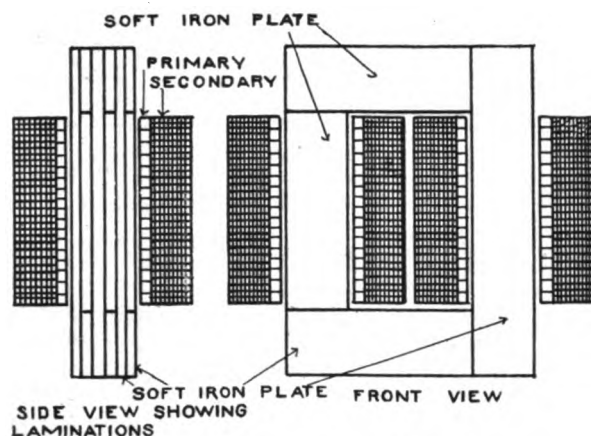


Fig. 16—Diagram showing the magnetic circuit of an alternate current transformer.

is probably not more than 10%. No actual measurements have apparently been made upon the efficiency of the induction coil used for ignition purposes, because of the great difficulty of measuring the actual result obtained in the spark. Measurements of the current and pressure delivered to the primary coil is quite easy, but measurement of the current and pressure actually delivered to the spark, is a very difficult matter indeed. It will be understood however, that if the efficiency of the induction coil can be raised from 10 to 20 or 30 per cent., the useful life of both dry cells and accumulators would be considerably increased. Assuming that the present efficiency is only 10 per cent.: that is to say, that of the power delivered to the primary coil of the battery only 10 per cent. appears actually in the spark, raising the efficiency to 20 per cent. should increase the useful life of any battery, the life before changing or before re-charging, at least twice.

There are two methods of decreasing the current taken by the primary coil. One of them, the writer believes, is being applied by the latest firms. The other he fears has not yet been applied, because the problem of the magnetic circuit of the induction coil has not been studied.

In the first method, the gauge of the wire employed for the primary is altered. In the usual construction of induction coils, a comparatively short length of thick wire is wrapped around the core, and a comparatively large current is taken from the battery. The magneto motive force, as it is termed, or the force tending to create the magnetic lines of force, the changes in which in their turn create the high pressures required in the secondary coils, depend upon the product of the current strength, multiplied by the number of turns around the iron core. In dynamo parlance, the term, ampere turns, is a very common one. It means the above product. It will be quite evident that the same magneto motive force, the same number of ampere turns may be produced by a large current and a small number of turns, or a small current and a large number of turns. There are two important objections to increasing the number of turns of the primary coil. One is the insulation upon the primary wire; the cotton or silk with which it is covered, occupies a certain definite space, and, therefore, each succeeding layer of the coil, is at a greater

distance from the iron core. This is not a very serious matter; but there is a certain definite gauge of wire, beyond which it is not wise to go. That is to say, assuming a large size of wire to have been employed for the primary of a certain induction coil, probably the same effect will be produced, with a smaller current, by several smaller gauges of wire, each gauge bringing an increased number of turns, and a decreased current, the ampere turns remaining approximately the same. After, however, a certain minimum gauge is reached, the ampere turns become decidedly less, and it is not wise to carry the matter farther.

The other objection is the increased self-induction of the primary coil with an increased number of turns.

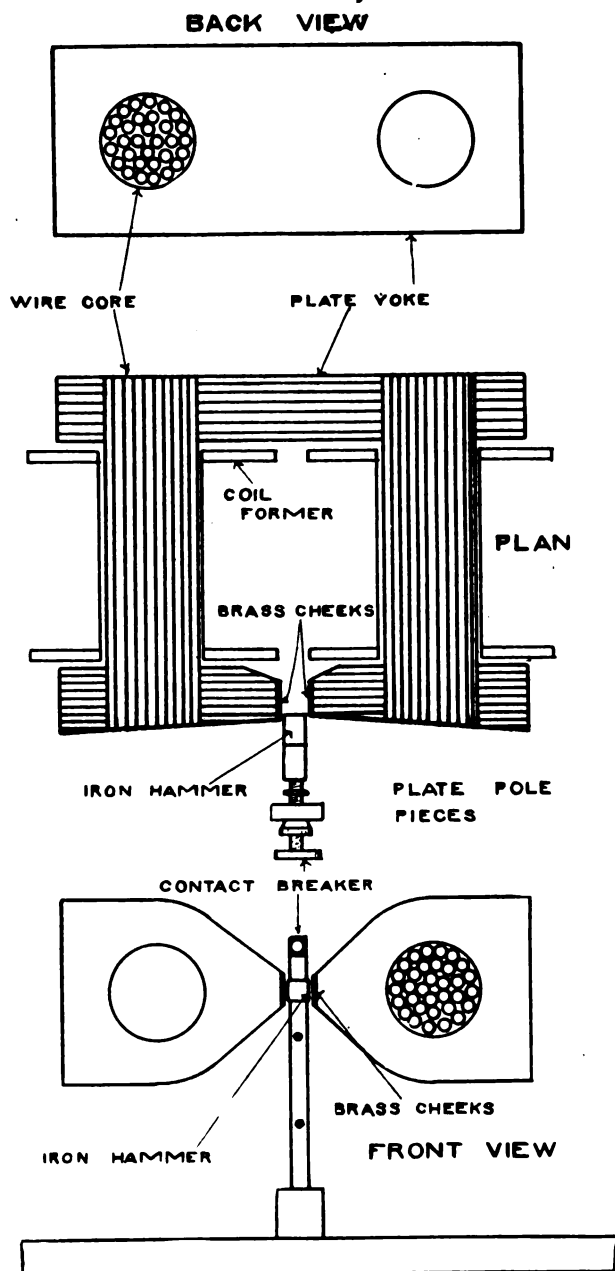


Fig. 17—Diagrammatic representation of an induction coil constructed on the line of an alternate current transformer, with closed iron magnetic circuit, the end induction coil having two legs.

Again, the advantage of reducing the current by reducing the size of the wire, more than compensates for this, down to a certain minimum gauge. It is not possible in an article of this kind, to give actual figures. The writer's hope is, that the hints he has given will lead those who are interested in the matter, to study and experiment

for themselves, and by so doing, to increase the reliability of the electrical ignition apparatus. Everything which goes to reduce the current taken by the ignition apparatus, increases its reliability, and decreases the attention it requires.

The other method of increasing the efficiency of the apparatus is one in which the writer's views will probably find opponents.

THE MAGNETIC CIRCUIT

In order that the proposed improvement shall be thoroughly understood, it would be as well to state the laws of the magnetic circuit. It was to the discovery of the

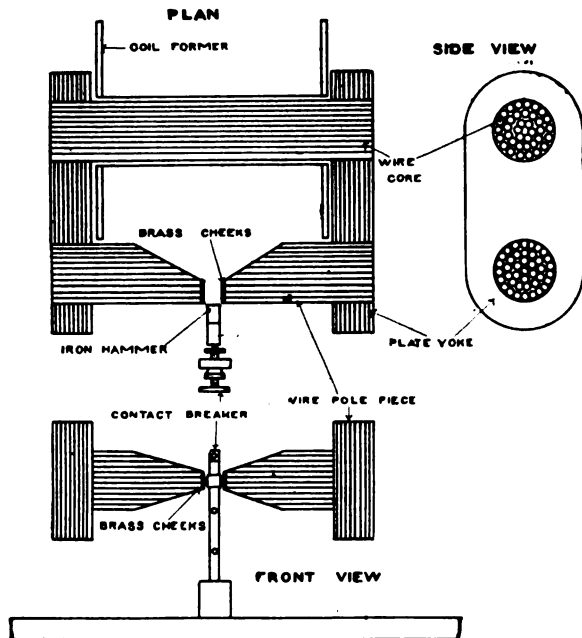


Fig. 18.—Diagrammatic representation of an induction coil with closed iron magnetic circuit, the completion of the iron circuit being made by bringing the ends of the iron core around to meet.

laws of the magnetic circuit in 1884, that the enormous development of the dynamo machine is due. Previously to its discovery, makers of dynamos were working in the dark. A certain machine gave certain results. It was extended in what was apparently the right direction, and sometimes it gave the results expected, but more often it did not. The law of the magnetic circuit, which was really the law of the dynamo, and also the law of the transformer, and should be the law of the ignition coil, threw a flood of light upon the whole subject. In all magnetic phenomena, there is a closed circuit, just as in all electrical phenomena. It will be remembered that in order that any electrical action can take place, there must be a complete electric circuit, including the generator, the apparatus that is to use the current, and the apparatus controlling the current. In the electrical ignition apparatus for instance, there are two complete electric circuits: the primary, including the battery, the primary coil, and the contact breaker; the secondary including the coil, the distributor where one is employed, and the sparking plug and spark.

In the magnetic circuit, there is a complete path for the lines of magnetic force. In the dynamo, it consists of the frame of the machine, the cores of the electro magnets furnishing the magnetic field, the core of the revolving portion of the apparatus, and the air space between the field magnets, and the revolving portion of the machine. In the induction coil, the magnetic circuit consists of the core, and the air between the ends of the core. Air offers a resistance to the path of the lines of force, 1460 times as great as that offered by the best iron. It will

be seen from this, how very high is the resistance of the magnetic circuit of any electrical ignition coil. The writer's suggestion is, that the same lines shall be followed in the core of the electrical ignition coil, as have been followed in the dynamo, the transformer and in the electric bell. In the ordinary electric bell, there is again a magnetic circuit, consisting of the two cores of the electromagnet, the yoke, as it is termed, connecting them at the back, the armature facing the poles in front, and the air space between the poles and the armature as shown in Fig. 15. Everyone who has had anything to do with electric bells, will remember how rapidly the pulling force of the electromagnet is decreased, when the armature recedes from the poles. This is due to the increase in the resistance of the magnetic circuit, owing to the larger air space.

In every magnetic circuit, the number of lines of force depends directly upon the magneto motive force, the number of ampere turns creating the magnetic field, and inversely when the magnetic resistance, or reluctance, as it is now usually termed. The magnetic reluctance depends directly upon the length of the path through which the lines of force have to pass, directly upon the substance forming the path, and inversely upon the sectional area of the path. Thus, other things being the same, a large iron core offers a smaller magnetic resistance than a small iron core. Other things being the same too, the longer the air path, the greater is the magnetic reluctance. In the ordinary induction coil, the air path is very long. It extends from one end of the core, round on all sides to the other end. It will be evident that if the path of the lines of force could be entirely in iron, as it is in the transformer used for electrical distribution of light and power, the magnetic reluctance would be enormously decreased. Fig. 16 shows the complete iron magnetic circuit of a transformer. The lines of force could be given a complete iron path, by either making the coil into two, as shown in Fig. 17, or by continuing the core round, outside of the coil, so as to form a complete loop, as shown in Fig. 18. The arrangement shown in Fig. 17 in which the coil is divided into two, is that employed in one common form of transformer.

Experimenters who take this matter up, and who try to improve the ordinary induction coil, by providing a core on the lines suggested in Fig. 18, a complete loop of iron, will be at first disappointed, for the reasons

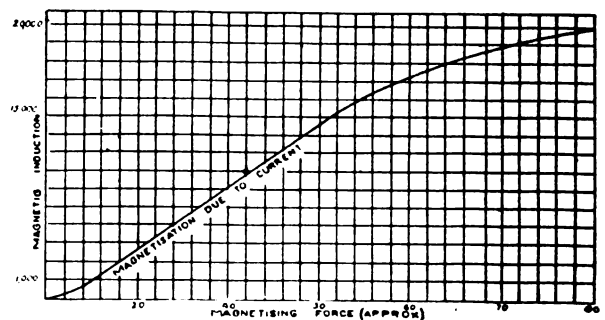


Fig. 19—Ordinary magnetization current, showing how the magnetic flux increases with the current.

given below. They will find that the ordinary induction coil, as it is now constructed, provided with a loop core, in place of the straight core, may even give a less efficient result, than it does at the present time. The less efficient result will be due to the fact, that they will probably not be able to get the same number of wires, the same cross section of iron into the core, as that in the core as at present constructed. The reason why, assuming the core to be the same size, no increased efficiency

is obtained, that is to say, the current is not decreased, when furnishing the same spark, is because under the present structural conditions, the iron core is magnetised up to its full point of saturation.

A little explanation may perhaps be of advantage here. As explained above, the strength of the magnetic field, the number of lines of force present in any field, or any part of one, depends directly upon the ampere turns

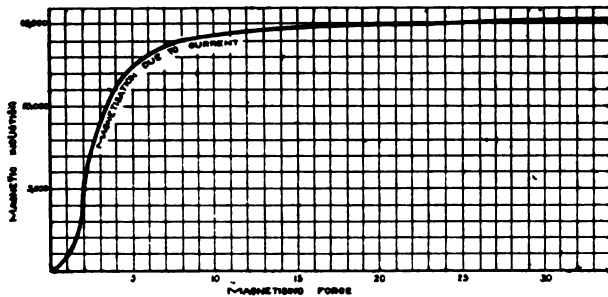


Fig. 20—Magnetization curve, showing iron saturated with magnetism after a certain current is reached. It will be noticed that there is practically no increase in the magnetic flux (induction) after 17, and very little after 10.

creating the field, and inversely upon the magnetic reluctance. The magnetic reluctance is made up of the resistance of the iron core in this case, and that of the air paths between the two ends of the core. As explained above, it is the air paths which offer the greatest resistance, but a certain qualification of the statement is necessary. Only as many lines of force can pass through a magnetic field, as the iron cores forming part of it, will accommodate. Or it may be put in another way. When a piece of iron is magnetised, the first effect of the current is very rapid: that is to say, if the current be steadily increased, the magnetic effect is also increased, in almost the same proportion, up to a certain point.

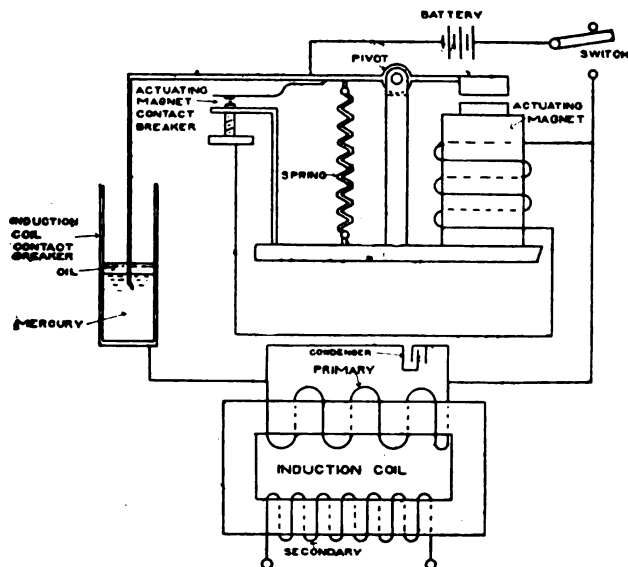


Fig. 21—Diagrammatic representation of an electromagnetically operated contact breaker for induction coils with closed iron magnetic circuits.

Then the magnetic effect produced becomes less and less, in proportion to the increase in the ampere turns. Finally no further increase of ampere turns will bring any increase in the magnetic field, and in certain cases where other effects follow from the production of a magnetic field. If the ampere turns are still further increased, the final result becomes less and less. Figs. 19 and 20 are typical magnetisation curve for iron, or magnetisable steel. According to the present practice in the construction of induction coils, the iron core is magnetised up to

full saturation. It is made to take as many lines of force as can possibly be crammed into it. Hence, no decrease of the reluctance of the magnetic circuit, by connecting the two ends of the core by masses of iron, has any effect. If however the section of the iron core was increased, and its ends were connected by masses of iron, in the writer's opinion, the magnetising current would be reduced, and with it the charge upon the battery.

It is fair to say, that the above suggestion is against the common practice among the manufacturers of induction coils, and it may be supposed that they have arrived at the best conditions. The writer believes that a core on the lines he suggests has never yet been tried. Makers have to keep on the old lines, with perhaps slight improvements, and are naturally afraid to make new departures.

A point should be mentioned here. When a closed magnetic circuit core is employed, a separate circuit breaking device will have to be added. This, however, is not a serious matter. A small electromagnet whose coils are included in the primary circuit, and which operates a contact breaker also in the primary circuit, as shown in Fig. 21 will do all that is required.

(To be continued)

LUBRICATION.

How Automobile Oils are Made and How Best to Use Them.

The importance of the correct lubrication of engines and the various moving parts of a car is so obvious that no excuse is offered for suggesting that a knowledge of the chemical and physical properties of the lubricants in use will be of service.

The motor engine presents many difficulties which require to be surmounted before correct lubrication can be obtained. We have machinery capable of developing tremendous power in proportion to its weight, extreme heat, sudden changes of temperature, high piston speed, vibration, and ill-usage to consider, to say nothing of dust; all these factors must be taken into account.

Friction has been described as "the force which is felt to resist the motion when one body rubs against another while in motion." The friction of quiescence (resisting to the beginning of the motion) is greater than the resistance of its continuance, and the friction of motion is entirely independent of the velocity of the motion. The resistance of friction to a shaft turning in a bearing has evidently a leverage in proportion to the diameter of the shaft. This point is taken advantage of in car practice where shafts and axles of wheels are made as small as possible consistent with strength.

Resistance that occurs between the circumference of a wheel and the road is known as rolling friction. There is always an obstacle to be surmounted in front of the wheel, and on the principle of the lever, larger sized wheels have an advantage over smaller ones. Friction is the constant opponent of motion, which creates heat—frictional heat.

Now friction absorbs power, generates heat, and causes wear, and the presence of a lubricant is thus necessary in an engine where shafts run in bearings and pistons move in cylinders. Lubrication is a necessity, and is the most important factor in the mechanical world. We have about the most perfect example possible of complete lubrication in the case of the joints of the human body. Every movement we make is only possible by reason of the wonderful provision of

nature in supplying an efficient lubricant between the moving bone surfaces; should by illness or inflammation (rheumatism, for example) a joint get stiff and unless we have a good simile of the seizing of a piston in an engine.

The lubricant between the two metallic surfaces forms—or ought to form, two films, one on each surface; those films serve to separate the two surfaces, and if this were purely a mechanical process lubrication would be quite a simple matter.

The films of oil absorb part of the heat generated by movement. This heat increases with velocity and continued motion, and were it not taken up and dissipated by the oil it would be absorbed by the metal with disastrous results.

Metal is capable of absorbing a large amount of friction heat, but is unable to rid itself quickly of this heat, so that lack of lubricant would result in overheated parts and stoppage of the engine. It will thus be seen that lubrication will be efficient only when the work to be done and the frictional heat generated are taken into account.

Frictional heat is generated by motion, and it vaporizes the lubricant, this was proved by Count Rumford's experiment. Rumford took a metal vessel with a hollow bottom and a perpendicular shaft fitted to it; this was rapidly rotated by mechanical power. The vessel was filled with water, and it was ascertained that after four hours the temperature of the water had risen to 140 degrees, owing to the absorption of frictional heat; in eight hours the boiling point of water—212 degrees was reached. After this the water began to diminish in bulk so long as the shaft was kept in motion. If oil be substituted for water the oil will gradually reach the temperature of its evaporation point and diminish in bulk.

Lubrication is, therefore, more than a simple mechanical matter of keeping two surfaces apart. The chemical part of the process consists in the evaporation of the oil, its transformation into a gaseous state, and the dissipation of heat by the oil while in this gaseous state. It is also to be remembered that friction occurs between the two films of oil themselves.

This evaporation takes place in every bearing on a small scale, or small, indeed, as to be imperceptible to our senses. Where a shaft rests heaviest in a bearing there is the line to be drawn where this invisible transformation of the oil from the liquid into the gaseous state takes place. This line is very small, perhaps no more than the thickness of a fine sheet of paper, but on this line the frictional heat starts to be generated and being taken up by a few molecules of oil at a time, is carried with the vapors into space. Through neglect, bearings may become overheated, and under the rapidly increasing temperature the few particles of oil may vaporize too fast and become decomposed by the increased heat, the vapor with its burning smell proving the slow and mysterious process by which the oil disappears.

The physical qualities of a good engine oil may now be considered. The oil should have a high flash point—this is necessary on account of the high temperature in the cylinder. It should remain as oil on the cylinder wall, and the film must be sufficiently viscous to remain an unbroken film in spite of the high piston speed. It should contain no substances likely to decompose and disintegrate under the influence of heat, as some animal and vegetable oils do, thus forming acids which may be injurious to the metal, causing roughness and friction, and preventing the formation of a film.

The oil should be as thin as possible for the work. Complete lubrication is a practical impossibility—we can only aim at a high state of lubrication. Too thick oil will have a good deal of quite unnecessary friction inside it, and too thin oil (while causing the least possible friction inside the oil) may not serve the purpose of keeping the metallic surfaces apart.

The oil should be odorless, not prone to "gum up," and should remain reasonably fluid at low temperatures. This is of importance, more especially in engines of earlier types where the lubrication is effected through small bore pipes with sight feeds on the dash.

A good cylinder oil ought to lose little or nothing when kept at a temperature of 212 degrees, for twenty-four hours; a loss of 1 per cent. should be sufficient cause for rejection. It should also possess the property of adhesiveness to hot metallic surfaces.

The basis of most cylinder lubricating oils is petroleum, a natural product which has been known from very early times, and found in nearly all geological formations. Hence its widespread distribution over the globe. Petroleum varies in its crude form, according to its place of origin. When found near the surface of the earth, the deposit is almost solid, or is a liquid of heavy specific gravity. This would seem to indicate that some filtering or evaporation had occurred, the more liquid portions percolating to the lower strata of the earth. The deeper the bore the more fluid is the crude oil that is found.

Certain crude oils are said to be quite suitable for cylinder lubrication after the simple treatment of the product with steam, introduced at the bottom of the still. As the oil emerges from the wells large quantities of illuminating gas are given off, and use is made of this for heating and lighting purposes.

On distilling the crude product, ethane, propane and butane are liberated in the gaseous state. These are collected and subjected to the action of a condensing pump, when the liquid known as cymogene is formed. This is used in freezing machines to produce an intense degree of cold owing to its rapid evaporation; it consists chiefly of butane.

The liquid constituents of the petroleum are separated by a process known as fractional distillation, which depends entirely on the difference in the boiling points of their constituents.

The part which distills over, consists chiefly of pentane and hexane, and is known as petroleum spirit—gasoline. The next portion of the distillate is chiefly heptane, and is known as kerosene oil. Oils whose boiling point is below 76 degrees centigrade are not safe for burning in lamps, as they so easily evolve vapor which forms an explosive mixture with air.

The portion of the petroleum which distills over between 150 and 300 degrees centigrade, is made up of nonane and dodecane, and this forms the basis of petroleum lubricating oils.

At higher temperatures still, the liquid which distills over consists of hexadecane and other hydrocarbons richer in carbon; these form soft solids—vaseline—and those containing most carbon form wax-like solids—paraffin wax.

As a result of the distillation of, say, Pennsylvania crude petroleum, we get the following:

Naphtha	4.3	per cent
Burning oil	44.2	"
Lubricating oil	45.7	"
Paraffin (solid)	2.7	"
Coke	2.2	"
Loss .....	.9	"

There are three distinct kinds of petroleum lubricating oils.

(1.) **Dark Cylinder Oils.**—These possess great body, and are obtained from the crude oil by the distillation process which frees them from volatile oils, and they are then filtered in order to remove paraffin and gritty matter. (The term paraffin means the solid waxlike substance.) Paraffin wax is extremely detrimental in a lubricating oil, as it becomes quite fluid and limpid at high temperatures and has no lubricating properties, though solid at ordinary temperatures. These oils vary much in consistency. Some are fluid, others semi-fluid. Their color varies from brown to black, and all have the characteristic bloom of petroleum oils, which is of a greenish color. These variations will depend on the source of the crude product and on the refining process.

(2.) **Pale Cylinder Oils.**—These are also prepared by distillation. They are of a brownish yellow color, and fluid. As a rule they have not sufficient body to be used by themselves for engine lubrication.

(3.) **Filtered Cylinder Oils.**—These are prepared by filtering the oil through charcoal. They are solid like vaseline, and possess a greenish bloom and brownish color, but they are not such good lubricants as the darker oils.

The leading authorities on the subject state that the best oil for the purpose of lubricating internal combustion engines is a pure hydrocarbon oil having a high vaporising point, viz., 260 degrees Fahr., a flash point of 430 degrees Fahr., and a fire test of 550 degrees Fahr. All these conditions can be fulfilled by petroleum products. As a test take a sample of oil, pour out, say, four ounces into a wide-mouthed glass bottle, and shake it thoroughly. This will give a rough idea of the composition and qualities of the oil from a few simple observations. The turbidity will show the presence of water or of oils which do not mix perfectly. A sediment will most likely be stearin or dirt; note the color—from straw, lemon, wine red to opaque. The "bloom" indicates the presence of mineral oil. To experts the odor and taste may reveal much concerning the source of the oil under observation. Fish oils when warmed have an unmistakable odor; whale oil is detected by its "nutty" flavor. By inverting the partially filled bottle and noting the manner in which the oil runs off from the bottom and the number of drops, an approximate idea of its viscosity may be obtained.

The best test, however, is by practical trial in the engine itself. It is a matter of great comfort for the motorist to know that there are so many first-class lubricating oils on the market from which he may make a selection. Presuming, however, that he is unlucky enough to come across an unsuitable oil, it is important to note that fresh oil of another make should not be added to the crank case before thoroughly washing out the engine with kerosene oil. Clean, good oil put into a dirty engine with gummed-up bearings has simply no chance of asserting its superiority under the unfavorable circumstances. It has first of all to get rid of the gumming round the bearings before its lubricating qualities will be manifested. Once the engine is accustomed to an oil which functions properly, that oil should be always used and none other.

So much for lubricating oil. How and when to apply it comes next. The New York & New Jersey Lubricating Company has just issued an excellent little book on lubrication, from which we are permitted

to make the following extract. It will be noticed that in the table the time intervals of lubricating are stated rather than mileage. The reasons for this are given by the author, Mr. Pickering, who says:

"When we were preparing our lubricating chart and table, we weighed up carefully the best way in which to specify the intervals at which lubricants should be applied throughout the car. It is self-evident that lubricants consume in proportion to the mileage driven, but it must be borne in mind that no two cars, even of the same model, will consume the same amount with the same mileage, as the frictional resistance in all bearings is proportionate to the actual work done, varying with the load, the nature of the roads, &c. It is obvious that specifications on the mileage basis for a light car would not apply for a heavy car. If we were to direct the attention of the motorist closely to his speedometer as the gauge of his lubricant consumption, we would be apt to lead him into trouble, with a table intended to apply for all cars. The specifications laid down in the chart are based upon the maximum work a car could be asked to do. This puts us on the safe side because if the motorist examines his bearings at the intervals suggested, he will either find that he requires a new supply of lubricant in the event that he has driven the limit, or that there is sufficient still unconsumed to last a little longer."

With the foregoing facts in view, the car driver or owner will find the chart on page 40 and table useful. They will be found as simple and convenient as they can be made, on the whole, but of course, the question of mileage must be constantly taken into consideration.

Each part requiring lubrication is lettered in the chart, enabling you to refer to the table below, which is alphabetically arranged and states the proper lubricants to use and the intervals at which they should be applied.

Monthly.

A—Brake lever shaft bearings Twice
A1—Internal brake cam oilers Once
A2—Rear spring bolt greasers Twice—Non-Fluid Oil
A3—Rear spring leaves Once—Non-Fluid Oil
A4—Rear wheel hub caps Once—Non-Fluid Oil
A5—Rear axle outside bearing greasers

Weekly—Non-Fluid Oil

A6—Magneto shaft coupling Twice
B—Brake fittings and connections Weekly
C—Clutch pedal bearings Twice
D—Clutch housing Twice

*E—Differential housing Once—Non-Fluid Oil

F—Rear universal joint Twice—Non-Fluid Oil

G—Gear shifter shaft Once

H—Front wheel hub caps Once—Non-Fluid Oil

*I—Transmission case . Once—Special Non-Fluid Oil

J—Air valve stem Once

K—Magneto oil cups and wells Twice

L—Steering knuckle bolts Twice

M—Commutator oiler and greaser Twice

N—Steering case greasers ... Once—Non-Fluid Oil

†O—Crank case filler and oil tank Daily

P—Front Universal joint ... Twice—Non-Fluid Oil

Q—Valve rod guides Weekly

R—Front wheel bearings Once—Non-Fluid Oil

S—Steering cross tube greasers

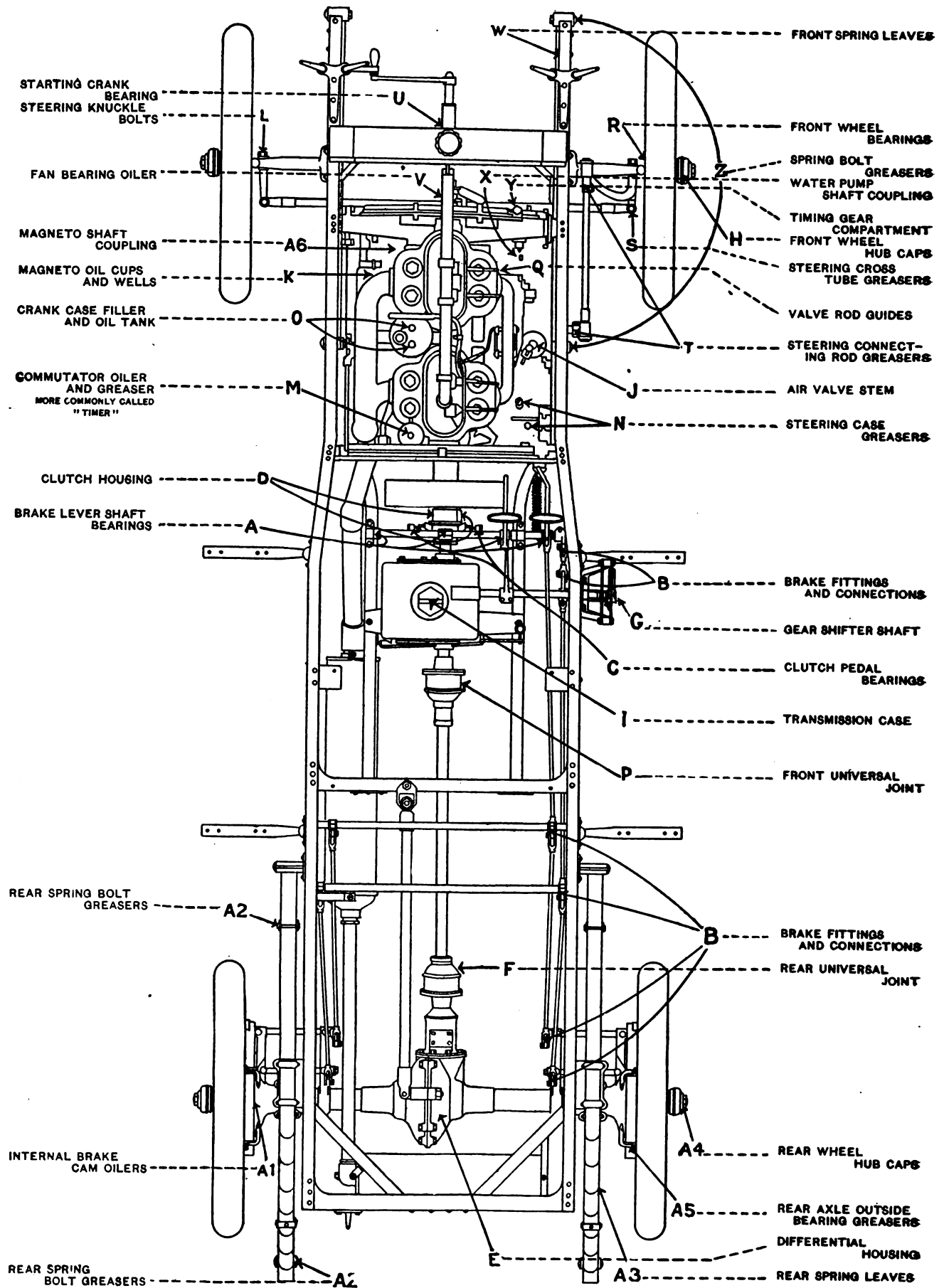
Weekly—Non-Fluid Oil

T—Steering connecting rod greasers

Once—Non-Fluid Oil

U—Starting crank bearing Twice

V—Fan bearing oiler Weekly



W—Front spring leavesOnce—Non-Fluid Oil
 X—Water pump shaft couplingTwice
 (If shaft has greaser)...Twice—Pump Lubricant
 Y—Timing gear compartment.....Once—Non-Fluid Oil
 Z—Spring bolt greasers.....Twice—Non-Fluid Oil

*One filling will average 1,500 miles. A little should be added each month to maintain the proper amount to insure the best lubrication.

†The oil tank should always be examined before starting out to assure a plentiful supply of oil for the trip.

CAM DESIGNS.

Their Relation to Effectiveness and to Silence of Operation.

From A. E. Potter, New York.—The simple designing of cams to actuate the valves of a gasoline automobile motor embodies very little ingenuity providing the lift of the valves is known and their timing has been decided upon. True, the

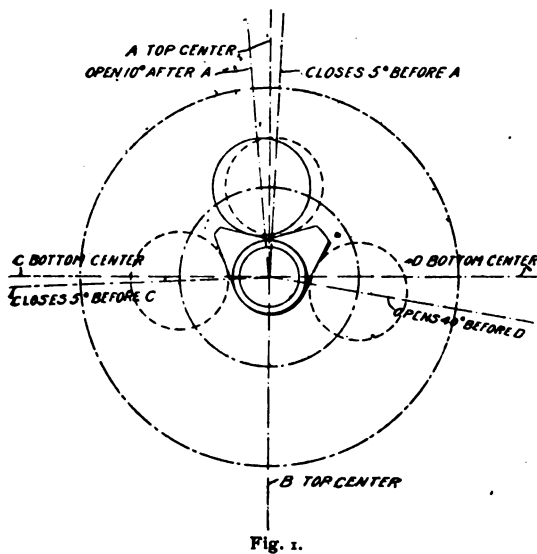


Fig. 1.

valves may make an unwarranted racket, and the entire valve operating mechanism may soon rattle to pieces, still the motor when new may give good power, fully up to expectations.

In a previous article, attention was called to the difference in lift of valves in order to get full valve opening with seats cut at 30 instead of 45 degrees, the usual angle employed. This is a small detail of design and one that no doubt many designers had never taken into consideration, but one, however small, that is extremely important. In like manner I will endeavor to call attention to the importance of the little things that have to do with as nearly noiseless cams as it is possible to make them, such as, size and proportions, rapidity of action, positive closing, &c.

As an illustration I propose to design the inlet and exhaust valves of a single-cylinder motor, exhausting once at each alternate revolution. The body of the shaft is to be $\frac{5}{8}$ in. diameter, the body of the cams 1 in. and the lift 4 5-16 in. The direction of the cam shaft is from left to right, clockwise. Fig. 1 shows the inlet cam in the position to open the valve 10 degrees after the upper center A to be sure that the exhaust valve is closed, and closes 5 degrees after the lower center C to reduce the vacuum in the inlet manifold to the minimum and yet not blow any part

of the charge back towards the carburetor. The exhaust valve opens 40 degrees before the lower center C, and closes 5 degrees after the upper center A. The diameter of the cam roller is $\frac{3}{4}$ in. The clearance between the valve stem and valve lift is 1-32 in. The upper lines through the body of the cams show the centers, A and B, and lower C and D. As both

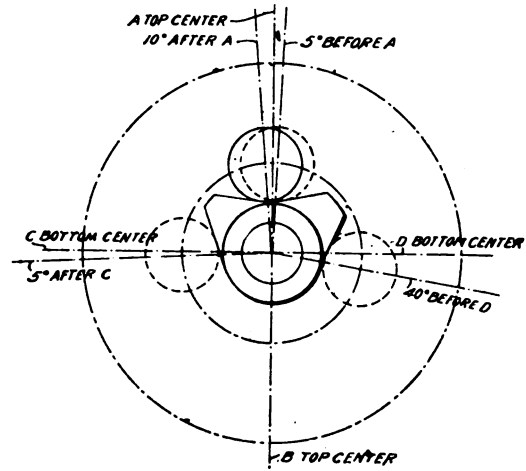


Fig. 2.

valves are to be on the same side of the engine, the two cams will be on the same shaft. The sketch, however, shows the inlet cam in the fore and of the corresponding exhaust cam the raised portion only.

The 1-32 inch clearance is shown with the cam roller that distance above the face of the cam. The opening side of the inlet cam is a line drawn tangentially to the roller 10 degrees after the center A and the body of the cam, while the closing side is another line drawn tangentially to the roller at a point 5 degrees

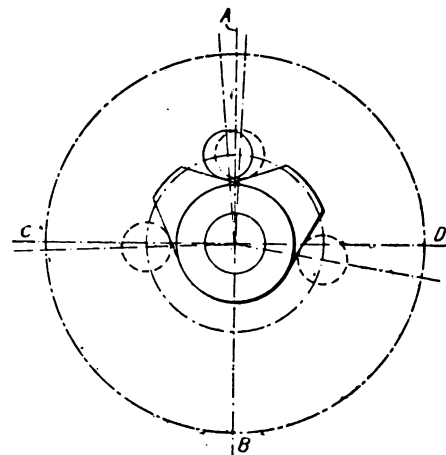


Fig. 3.

after the center C and the body of the cam. But as the cam shaft travels but one-half as fast as the crank shaft, these distances have to be just one-half 10 degrees and 5 degrees, respectively, 5 and $2\frac{1}{2}$ degrees instead of the figures of the angles as given in the illustrations.

In like manner the exhaust cam is laid out the opening side tangential to the roller 40 degrees (in reality 20 degrees) before the lower center B and the body of the cam and the closing side 5 degrees (in reality $2\frac{1}{2}$ degrees) before the upper center A.

Fig. 2 shows the same opening and closing of both

cams and the same lift, but the size of the body of the cam is reduced from 1 inch to $\frac{3}{4}$ inch and the cam roller diameter increased from $\frac{3}{4}$ inch to 1 inch, while Fig. 3 shows the body diameter increased to $1\frac{1}{4}$ inch and the cam roller reduced to $\frac{1}{2}$ inch.

A comparison of the shape of these three cams, by varying the diameters of the cam rollers and cam bodies, will at once show that the smaller the latter

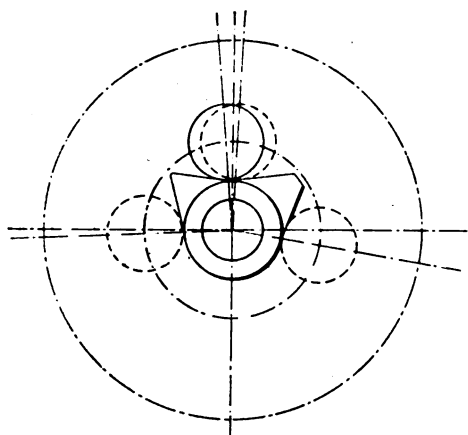


Fig. 4.

and the larger the former, the more easily the valve will open and at the same time more quickly, while the larger the roller and the smaller the cam body the more slowly the valve will open and close.

In Fig. 1 the valve will be full open, fully three times as long as in Fig. 2, while in Fig. 3 the valve will remain open nearly twice as long as in Fig. 1.

If the motor does not run too rapidly the Fig. 3 rollers would follow the periphery of the cams better than in either Fig. 1 or 2. In Fig. 2 rotating the cam shaft rapidly the roller would follow up the cam in opening, and unless the valve springs are very stiff, no matter how the corners of the cams are relieved, there is a serious question whether or not the rollers would follow the cams in closing. Just what the effect would be in the later closing of the inlet valve

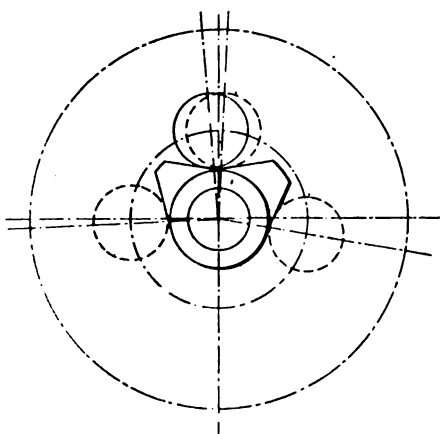


Fig. 5.

is of no great consequence, as it would not matter greatly, but I can see baneful results from having the inlet valve open before the exhaust valve closes, with a tendency to draw exhaust gases into the cylinder on the induction or gas inlet stroke.

The result of reducing the clearance between the valve stem and body of the cam to $\frac{1}{64}$ inch is shown in Fig. 4, while increasing it to $\frac{3}{64}$ inch is shown in Fig. 5, the proportions of roller and cams

being as in Fig. 1. The shape of the cams in Fig. 4 more nearly resembles those in Fig. 2, while Fig. 5 cams are slightly wider at their points than are those in Fig. 1.

With the corners of the cams all relieved to allow of easier following of the rollers, those in Fig. 1 would open more quickly than would those of Figs. 2 and 4. Those of Fig. 3 would open more quickly than either of the others, while the Fig. 2 cams would more slowly than any of the others. The cams in Fig. 5 would be noisy, although probably not so bad in this respect as those in Fig. 2.

Fig. 6 shows an expedient to get quicker opening and closing of cams. It consists in offsetting the valve lifter slightly. To illustrate, I have taken the original proportions in Fig. 1 and offset the axis of the lifter $\frac{1}{4}$ inch, and we can thus see what effect such a change in design will have. The shape of the cam (the inlet only being shown), is practically the same as in Fig. 1, the points of tangency of the body of the cam and the roller are the same. The distance from the point of contact of the roller and cam to the point of the cam is slightly less, and the roller would continue to rise after the point of the cam was reached.

The valve would open more quickly during the

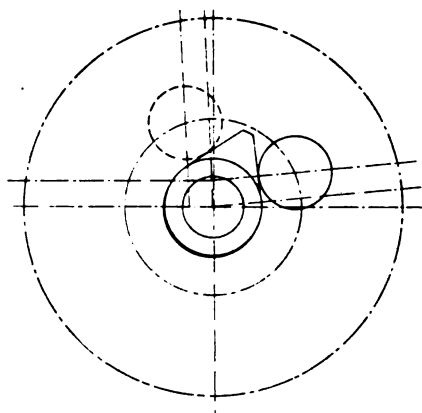


Fig. 6.

greater part of its lift and after passing the second point, the extreme lift, should close more quickly than in Fig. 1 and all other conditions being the same should be a quieter design, and one not nearly so hard on the reciprocating parts, as the side thrust would be considerably reduced and the upward action more direct.

There is at least one motor on the market with this feature of offset valve lifters and I have often wondered why this idea was not more generally followed. The adoption of 30 degree valves seats, should remove at least two of the causes of noisy, rattling, short lived valve gear.

A Flywheel Knock.

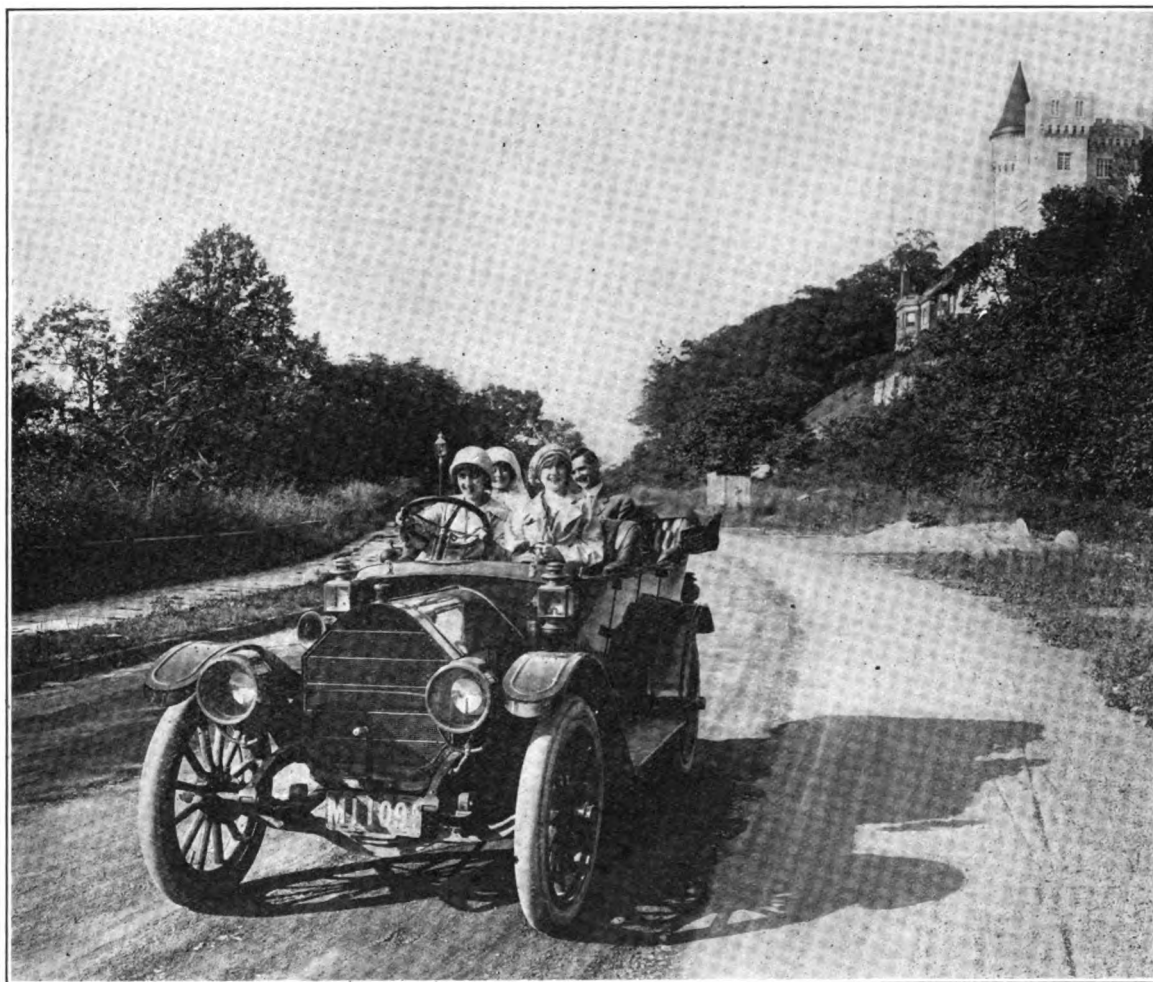
A form of knock which is usually very pronounced and develops very suddenly, is caused by the flywheel becoming loose upon the end of the crank-shaft. It is comparatively difficult to test for such slackness, for although a flywheel may be sufficiently loose to cause a very bad knock it is rarely apparent when the flywheel is turned in either direction against compression, or against the effort of a second individual holding the starting handle. The removal of the crank-shaft and the making of a bench test are usually necessary. In the case of a flywheel being loose a clue is often obtained, as such a defect gives forth a knock at every impulse of the engine.

THE 1912 MAXWELL LINE.**A 36 Horse Power Touring Car Which Will Sell for \$1280.**

Announcement has been made of the 1912 line of Maxwell motor cars, wherein the details are given of the leader of the line, which is to be a 36 h.p., touring car at \$1280. The United States Motor Company, in making its announcement, expresses the belief that cars in 1912 will sell on power, style and price and

Such details as ventilated fore-doors, inside control, deep tufted cushions, and flush side bodies and the highest class of painting are cared for in the Maxwell line 1912.

The officers of the United States Motor Company, realizing that most of the cars to-day are reliable, instructed its force of engineers to direct their attention to the production of a car which would not only perpetuate the Maxwell reputation for reliability, but give additional power, combined with beauty of de-



Maxwell 36 Horse Power Touring Car Selling for \$1280.

these three predominating elements are embodied in the highest degree in the new Maxwell Special.

The new car will have a long stroke motor $4\frac{1}{4} \times 5\frac{1}{4}$, full floating type rear axle and drop forged front axle, Stromberg carburetor, extra large multiple disc clutch, Columbia type square tube radiator without the brass band that has been prominent on Maxwell cars in the past, dual system ignition, Splitdorf magneto, force feed oiling system, sliding gear transmission, 34 x 4 tires, 114 inch wheelbase, and equipped with a five passenger ventilated fore-door vestibuled flush side steel body, finished in royal green, with Wedgewood green wheels.

What the purchasing and manufacturing departments of the United States Motor Company have accomplished toward greater automobile value is newly reflected in the new Maxwell models as they supply ample power under all conditions of travel, a new and extremely stylish appearance and new standard value by which popular priced cars must be judged.

sign and appearance at a price that would guarantee instant supremacy.

The new 36 h.p. Maxwell special is the result, together with four other Maxwell models. The big Maxwell will be known as the Maxwell Special, with three other classics to be known as the Maxwell Mercury, the Maxwell Mascotte and the Maxwell Messenger. The Maxwell Mercury is a test proven mile-a-minute roadster that will list at \$1150, a price which is another instance of Maxwell value. It is equipped with a ventilated fore-door flush side vestibuled body, has a Columbia honeycomb type of radiator, with new designed hood, high tension racing magneto, Stromberg carburetor, demountable rims, and a wealth of refinements. The Maxwell Mascotte is a 25 h.p. car listed at \$980. for the touring car and \$950 for the roadster. This is a continuation of the model "T" which was such a favorite during 1911, and, in connection with which the Company expresses its regret at its inability to supply all the cars which were de-

manded. An increased production should put it in better condition to meet next year's demand. It will have a 4 x 4 motor with new ventilated fore-door vestibuled body with inside transmission control body and finished in dark blue, with the wheels in battleship gray. It has a Columbia honeycomb type of radiator with new hood of handsome design, irreversible worm steering gear, Stoddard-Dayton spark and throttle control. The springs are of imported English steel and the bearings of German chrome vanadium. So successful has been the 16 h.p. runabout during the past year that it will be continued for 1912 with certain refinements, and under the name of the Maxwell Messenger.

With 45,000 Maxwells in use, and the reputation the car has among owners, the 1912 product of the United States Motor Company is expected to receive a great reception. In connection with the marketing of its cars in the future the United States Motor Company has instituted the "Satisfied Owners' Inspection Service" which gives every purchaser of its cars the privilege of going to its branch house or dealer to have his car inspected once a month, if necessary, with a view to greater efficiency and satisfaction.

SPARK PLUGS.

Some Useful Information About Various Kinds, Their Care, Material and Use.

From E. Q. Williams, in *Gas Power*.—The question as to which is the best spark plug can never be answered only in a general way.

Spark plugs are of two varieties, jump and make and break; the latter class includes the magnetic and compression plug which take the place of the common make and break mechanism.

The jump spark plugs are made with various materials for insulations and in various forms, each of which is intended to give better service than any others.

The insulating materials used are mica, porcelain, stoneware, glass, lava, soapstone, etc., though almost all are made of either mica or porcelain, the endeavor of each maker being to get a material that will not break and a shape that will prevent trouble from carbon deposits, for no material so far known is proof against the deposits of carbon, which will carry the spark away from the points and so prevent the charge firing. So far apparently, the best method to prevent fouling, seems to be to make as large a space as possible in the gas chamber.

Some plugs have been made as shown in Fig. 1, in which the insulation completely fills the chamber. This is not satisfactory to the user as the carbon simply bridges across the end and quickly puts it out of business.

Another style is shown in Fig. 2, where the size of the insulated core is reduced so that there is considerable space between the shell and core. This is much better as the carbon must cover the core completely down to the shell in order to make it leak. Another method is to make it with a kind of petticoat, Fig. 3. This divides the gas chamber and it is necessary to carbonize all of the surfaces to make the plug leak. Still another is a modification of this one, as the porcelain is shorter in the petticoat; others cover the end by part of the shell, with the idea of preventing the soot and carbon from getting on the insulator.

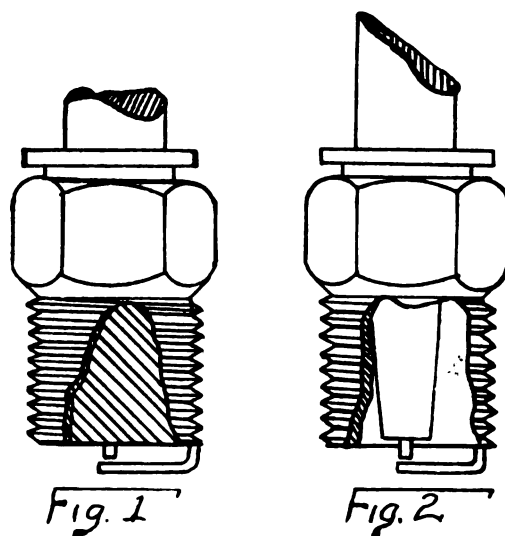
In some a series of what might be called baffle plates is used to prevent the soot depositing on the insulator.

The idea in all of them is to form space enough so

that part of the gas will remain in it all the time and prevent the new gas from penetrating to the bottom and depositing its soot or carbon when it is fired.

For mechanical reasons the shape of the mica plug is practically the same in all makes, as they are made from mica washers mounted on a mica sleeve, which surrounds a central iron rod with a head on one end and a screw thread on the other as shown in Fig. 4. These washers are usually about $\frac{3}{4}$ of an inch in diameter, and after being mounted are subjected to a heavy pressure, the nut screwed up and then they are turned or ground to shape and size.

The washers themselves do not offer any practical resistance or insulation to the leakage of the spark,



as they lay horizontally, and the spark can slide through between them with very little trouble. The tube, however, is made up of about 20 or 30 layers of thin mica and is the main reliance for insulation as the sheets stand squarely across the path of the spark; therefore it is essential in choosing a plug, to choose one that has a substantial tube.

The great objection to a mica plug is that it opens up and fouls easily when in a hot motor. This is because under the action of heat, mica expands much faster and more than steel, and it is impossible to prevent this, so that if a mica plug is put in a place where it is very hot, it will expand and stretch the steel rod so much, that when it cools, the mica will contract to its original size; while the steel will not come back to its size. This leaves the washers loose, the carbon then finds an easy place to lodge and the plug is soon short circuited. Always put your plug in the coolest place that you can. They are usually placed where the incoming gases will strike them so as to partially clean them and also to be sure to have fresh gas to fire. Of course their position cannot very well be changed after the motor is made, but it is a good thing to look out for in selecting a motor; also see that they are not set so the hollow end points up, as they will form a cup in this case and hold the oil which will soon put the plug out of business.

When screwing a cold plug into a warm cylinder, do not screw it in as tight as you can, for if you do the chances are very good that you will have a good sized circus trying to get it out again when it has heated and cooled a number of times. They seem to have a peculiar faculty of increasing their size and as all the oil burns off between the surface of the plug

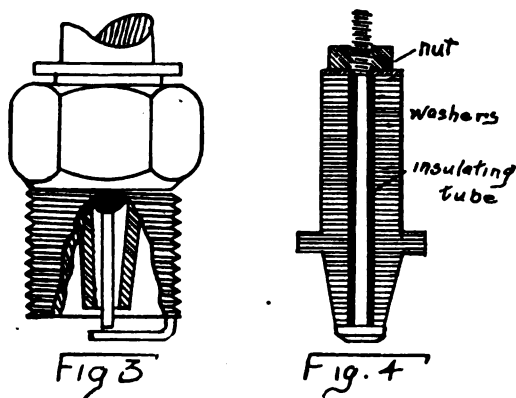
thread and cylinder head, they set tight and require careful and sometimes heroic treatment to make them release, frequently resulting in the destruction of the plug. Screw them in with the fingers as far as they will go easily, then put on the wrench until they begin to feel fairly snug, then quit, the next pull is dangerous.

Lubrication, while it is life to the motor, is the one thing that causes the most trouble to plugs. Burned oil is carbon, carbon will carry a spark as well as a wire and it covers everything in the plug with a thick black coat if the oil is not right for perfect ignition. A good oil is an absolute necessity and it is also necessary that the quantity should be right. Flooding is as bad for the spark as starving is for the motor. Study your conditions and strive to get the quality and quantity right; it will go a long way toward giving you perfect ignition.

The exhaust should never show the clouds of blue smoke so often seen; this is a sure indication of too much oil.

A black smoke from the exhaust means that there is too rich a mixture; this will also deposit carbon and make trouble; it also cuts down the power of your motor as a motor cannot do its full work without it has a perfect mixture to work on.

It is commonly supposed that a plug is put out of business by carbon getting across the points; this is not so, it is the carbon deposited on the insulation as stated before; this leakage cannot always be shown by putting a plug on a cylinder and testing to see if the spark passes between the points, but it will show up very quickly if a piece of mica is inserted between the points so as to force the spark to jump a longer distance. If there is broken down insulation or a carbon leak, the spark will choose the shorter and easier path;



breaking. A copper asbestos gasket makes a much easier packing to get the porcelain out from.

Compression leakage around the outside of the plug and also through its packing can be easily found by putting a few drops of oil around it or inside the gland and watching for bubbles while the engine is running; if none appear the plug can reasonably be assumed to be tight.

The right spark gap is another difficult thing to solve; it depends upon the engine coil and compression, and can best be determined by a little experimenting on each particular engine. In general it runs about 1-32 to 3-64 of an inch. Magneto makers advise less, from twenty to thirty-five one-thousandths of an inch (one-thirty second of an inch equals thirty-one, one-thousandths) the shorter the gap the less danger of the spark leaking through carbon or cracked insulation. If your engine misses when under a heavy load as in climbing heavy grades, shorten the gap or if it skips when throttled down pretty well, widening the gap may help it.

Some years ago the visible or auxiliary spark gap was all the rage; this was supposed to make the dirtiest plug work, as its action was supposed to be similar to that of damming up a small stream until enough water had accumulated to break down the dam and let the accumulations run on to do their work. In the same way the extra gap in series with the plug was supposed to hold back the current until enough had accumulated to overcome the resistance of the gap when it would rush to the plug, giving the accumulated energy to the plug gap all at once.

While it had a short lived run, it was exploited in many forms from a gap on the coil to one inside of the plug; most of them, however, were somewhere in the secondary circuit between the two. One manufacturer mounted the gap on the dash board of the car, etc. These gaps certainly help some when there is trouble with a dirty plug, as they seem to make the firing more certain. In another way they are a great convenience in that one can always see if the spark is passing or not. When the spark shows clean and bright in the gap there is no use in looking for trouble in the coil or batteries.

When using a mica plug in connection with the gap, the spark will sometimes almost disappear and the engine stop firing; when the trouble is merely a dirty plug, the fact that the spark disappears from the gap makes it appear as though the trouble was in the coil or batteries, but this is very apt to be misleading.

The writer cannot explain why a dirty plug will sometimes cause the spark to disappear in a gap outside of the plug, but it is a fact which I have demonstrated several times and if one is looking for trouble, the coil or batteries will usually be suspected when in reality it is a dirty plug. I have never known this to occur with a porcelain plug, however.

Physician Sets His Own Wrist.

Dr Carolus M. Cobb, of Lynn, Mass., recently set his own right wrist, which was broken in cranking his automobile motor. The doctor had driven his machine to Tapleville for the purpose of obtaining a history of a house there. While engaged in the study of the house, the machine became cold, and in cranking to start it the crank flew back, inflicting the injury stated. Dr. Cobb reduced the fracture himself, procured a couple of shingles, which served as temporary splints, and had them bound on by a friend. In this condition he drove the machine back to his home in Lynn, and the principal difficulty he experienced en route was in manipulating the lever.

while if the plug is all right, the spark will go over the edge of the mica and down the side to the other terminal. The writer always carries a small piece of mica for this test in his pocket.

Pouring a little gasoline into a plug and washing it with a brush or waste, will sometimes clean them sufficiently; at other times it is necessary to take out the insulation and clean it thoroughly. If it is a mica plug, it will frequently make them as good as new to put the mica core in a lathe, and clean it up with a piece of fine sand paper or emery cloth while it is revolving rapidly as the edges of the mica washers frequently become so carbonized that they do not clean well enough with the simple washing.

In selecting plugs it is a good plan to select one that can be easily taken apart for cleaning; some are packed with loose asbestos packing to prevent the porcelain from breaking. This jams in the threads and render it difficult to remove the porcelain without

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ADVERTISING RATES MADE KNOWN ON APPLICATION.

NEW YORK, AUGUST, 1911.

Missing Numbers—Our Readers are requested to remember that it always gives us pleasure to re-send numbers which have gone astray in the mails.

The Automobile Dealer and Repairer in Australia and New Zealand.

Mr. R. Hill, Matlock House, Devonport, Auckland, New Zealand, is our accredited representative in Australia and New Zealand for obtaining new subscriptions.

SATISFIED OWNERS.

The reason why automobiles have not displaced horses more rapidly, both for pleasure and for business and commercial use, is not due so much to the automobiles as to the manufacturers and to those who have purchased and are using them. As illustrating this point we quote the following from a reader who has a large provision and meat store and who runs a delivery car:

"We are the only ones in this city of 13,000 inhabitants to adopt it, and while we don't call our experiment a failure, because we really had studied it out partially in advance and did not go in imbued with a one-sided view of the proposition such as the trade journals and manufacturers' articles tend to create, yet the troubles we have had and the lack of attention we have until recently been subjected to from the makers, has deterred probably a dozen others who really were anxious to go into it. We should judge that the old rule about the value of a 'satisfied customer' would be especially applicable in this business. We are not talking wholly from our own experience, but also from the results of some careful investigation."

The writer of the foregoing adds that: "If more attention would be paid by makers to getting up substantial machines, standardizing parts, making machinery more easily accessible to get at, and then paying a little attention to looking after the needs of users, there would be more disposition on the part of business men to put them on."

In our opinion the trouble lies more in the handling and use of the delivery cars and of all other cars, than anything else, and the unwise handling and use is largely due to the too frequent failure of the manufacturer or the sales agent to give full instruction and attention to purchasers.

The fact that many manufacturers guarantee their automobiles for a year and one or two "for life" is evidence,

if there were need of any, that they give very little trouble nowadays if properly cared for and driven. But this is no reason why the purchaser should be expected to understand all about his car and its running after a few impressive words of the salesman and the receipt of a book of instruction from the manufacturer. In many cases the purchaser unintentionally begins to abuse his car the first time he uses it, and he is pretty sure to commit some fault of omission or commission, no matter how hard he may try to avoid it. In fact, there is so much for a man to learn new in the idea of carburetion, transmission, ignition, batteries, brakes, clutches, lubricants and lubricating, to say nothing of the principle of the internal combustion engine, the only wonder is that he is able to digest one-quarter of it at one "fell swoop" as it were, to say nothing of the whole of it.

To remedy this trouble and to insure the highest possible efficiency in the cars that it makes, the United States Motor Company announces the adoption of the "satisfied owners policy" with free inspection service for all cars. Under this plan every buyer of a car made by the United States Motor Company which includes the Columbia, Maxwell, Stoddard-Dayton, Courier, Liberty-Brush, Brush runabout and Sampson Truck, may have it inspected by the dealer or branch house, as often as once a month if necessary for one year without charge.

The owner of one of these cars is assured of knowing just what is required to have his car working at its most efficient point, and while months may go by when the car will not need attention, the owner will have the privilege during the first year, of taking it to the dealer for inspection, while reasonable adjustments of the carburetor and magneto will be made without charge.

The new plan became effective August 1st, and is particularly comprehensive, as the company has forty-two branches and eighteen hundred dealers throughout United States, Canada, Mexico and Europe.

The General Motors Company have also decided to hereafter pay more attention to their trucks after they have been sold, and have organized a service department which it is understood will look after their cars as long as they are operated by the users.

As before stated, the foregoing step should have been taken by manufacturers long ago. For even if their salesmen have the necessary experience and knowledge of automobiles and how to run them and care for them, they have too often neglected to give purchasers the instruction and attention that the importance of the transaction demands.

AN ETERNAL LAW.

As we lambaste the trusts and high prices, let us not forget that there is one law, as inexorable as that of the Medes and Persians, that will knock high prices to smithereens, so to speak, and the gates of monopoly shall not prevail against it.

We refer to the eternal law of supply and demand which so often enforces the boycott of self preservation. When prices soar too far skyward the plain citizen with the still small voice begins to do without, and when his doing without begins to multiply, prices come tumbling down of their own weight, without any interference of government or class or clique, and neither trust nor combination can prevail against them.

And this is the case with everything that man eats or wears or uses. When steak goes up two cents a pound the thrifty housewife gets corned beef or a pot roast;

and when these are beyond her reach, she takes to the nutritious bean and the nourishing cereal. When the all wool garment does not fit our purse strings, we take one with a cotton thread in it. When the average shoe goes higher than \$3.50 a pair, we just wear the old ones a little more run down at the heel and with a little wider crack in the upper. When the cost of the new house rises, we conclude we will live in the old one a few years longer. When the five cent cigar begins to taste too much like the universal cabbage, we purchase a pipe—brier or clay, as the condition seems best to warrant. When the railroads raise the cost of transportation, as they are prone to do, we do less transporting—we put off that trip or in some way get along with a little less freighting. When the labor trust puts the figure too high of painting the automobile then we conclude we can get along for a time longer with the scratches and the cloud effects.

Now we confess this "doing without," although potent is mighty inconvenient, and with those of abundant means it is near to impossible. But we are of the rank and file, of the great majority who outnumber those of great wealth as one hundred to one.

This law of supply and demand is no respecter of persons or principles, of justice or morals. It makes vassals of great poets and peers of ignorant pugilists; it destroys "gentlemen's agreements" even more ruthlessly than gentlemen often do themselves; it puts the walking delegate to rout, or, *mutatis mutandis*, makes the "horny handed son of toil" as bumptious and indifferent as a dime novel reading office boy.

But when stern necessity stares us in the face is there a single thing that we wear or eat or use that we cannot either do without or partly fill the need by the adoption of some substitute?

And thus is there balm in Gilead for the trust victims and a fly in the ointment for the trusts themselves.

THE AUTOMOBILE SAFETY VALVE.

One of the New York newspapers has estimated, after investigation, that automobiles take into Long Island, N. Y., every year to be expended there, the enormous sum of \$25,000,000, allowing for the dull winter months. This includes payment for gasoline, oil, repairs, garage charges, meals, etc.

The lesson pointed out by the newspaper referred to is that with such an incentive the authorities may well see that the roads are kept in good condition to encourage this traffic. So they may, but they do not.

But more vital than this is its indication of what the automobile is doing for the entire country. Surely, no invention or industry growing out of an invention during the past 100 years, has done so much to promote business activity and general prosperity. It may be claimed that the cash and work devoted to this business might have been turned into other and possibly more useful channels had the automobile never been put to use. But this is doubtful. Some of the money thus expended would have been taken abroad by the wealthy and this in its broad sense is the most impoverishing form of national expenditure. In its effect upon the public welfare the spending of large sums in foreign countries is an absolute waste; it makes the home country just that much poorer. The spending of money at home has about the same effect upon the country as it has upon the individual when he transfers his cash from one pocket to another; he is really no poorer for it.

But there is another consideration in relation to the advent of the automobile. Suppose it had not sprung into existence, and the hundreds of factories

for cars and for accessories giving employment to hundreds of thousands of workers and the amount of money distributed by the wealthy in travel had thus been impossible, what would have been present conditions of employment for labor, and how would the diffusion of concentrated wealth, so essential to the general welfare, have been effected?

Why, says some one, this surplus of effort and of money would have been diverted into other and perhaps more useful channels. Very well; what other channels? Even with the existence of this mighty automobile industry there is no dearth of other products that man uses. There are manufactured goods enough of all kinds, and indeed, producers are even anxiously looking abroad for the disposal of their surplus.

We may be mistaken, but the chances are that if it had not been for the creation of this mighty automobile industry we should be suffering from a business depression and from enforced idleness on the part of labor that would have been simply appalling.

Most decidedly the advent of this wonderful vehicle of travel came along just at the needed time. The whole country is the more prosperous for it. And when the automobile shall have come into universal use, and the necessary production to supply the demand ceases, the public welfare will require another similar and just as revolutionary invention and consequent industry to keep the wheels of progress moving. Failing in this, there will be enforced idleness, business stagnation, and their consequent penury and want.

When as has recently been stated by men who know, this country can supply in eight months all the manufactured and agricultural products it can consume in twelve months, and when every other enlightened country is in the same situation, the occasional advent of some new and revolutionary industry is absolutely indispensable to national welfare.

People will begin to wake up before long to the fact that 20th century production, with its wonderfully effective and automatic machinery, has far outstripped consumption, and that something must occasionally be devised to care for the surplus industry and energy or there is likely to occur things akin to social cataclysm.

Those who oppose great industrial evolutions like the advent of the automobile are simply trying to sit on the safety valve when the boiler pressure is right up to the danger point.

ABOLISH GRADE CROSSINGS.

As a matter of fact there should be no such thing as a locomotive railway grade crossing. They are a relic of an age now past when railroad corporations were given almost anything they asked for simply because they served to open up and develop the country.

It is true they are being abolished to a certain extent, but in most cases only where putting an end to them is inexpensive and where they are as much or more bother to the railway than to the public. In case the interests of the public alone are concerned, as in country places where it costs the railroad little or nothing to maintain the grade crossing, the time-worn warning, "Look out for the engine when the bell rings," being all that is required, it is almost impossible to secure any relief. But where a guard with a flag and gate are necessary, it is not so difficult to secure the remedial legislation.

In a matter of this kind it seems to us that in too

many instances our law-makers and public officials have forgotten or they never fully comprehended the test by which its expediency should be decided. There is no other means than an answer to the question, "Will the abolishing of grade crossings promote the public welfare?" In deciding this, the interests of the railways and of all else are subordinate.

And, by the way, would it not be better if all legislation were absolutely based upon this test? At present, one official seems to feel he was chosen to look after the interests of corporations, another to look after the interests of labor and of only organized labor at that, still another to guard the interests of some race or class or clique. It is time to call a halt and to get back to first and basic principles: we have no right to make any law whatever that does not promote the public welfare; we have no right to neglect making any law that will promote the public welfare.

COMING INTO ITS OWN.

This publication was the first to advise the repeal of the fixed limit of speed laws for automobiles and the substitution of laws making any speed unlawful if it endangers the life, limb or property of others. We are glad to see that this idea is now becoming more popular and that the time is fast approaching when it will require something besides a stop watch to convict an automobile driver of a crime.

Four years ago but one State, and that was Florida, had the reasonable and proper rate as its standard, but at present this law is in force in several States, and these are mostly where the automobile is widely used.

Another good law is the one now in force in Connecticut, where the fees and fines for violations of the law are turned over to the Secretary of State and expended under the direction of the highway commissioner for the maintenance of the roads. This tends to obviate the zeal of local authorities for the perquisites and other emoluments of office, and to make more rare and less iniquitous the speed and other traps set to catch the unfamiliar and unwary.

Let the good work go on. When speed limits are finally abolished in all States except as they endanger other users of the highways, the adoption of a federal law applying alike in all States will be in order. The automobile is an inter-State vehicle. Its owner or driver should have confidence that what is lawful in one State is also lawful in any other he may chance to go.

Before that time it is also desired that all laws may be repealed compelling relicensing when in another State.

When this is accomplished and all are removed who imagine that a car can be run on an ungraded public highway as fast as a railway train is run by a skilled engineer on a smooth graded private road, with flanged rails to keep the wheels on the track, the automobile will at last come into its own.

Gearing.

In general the term "gearing" is applied to all parts of machinery by which motion is transmitted; especially is it employed for wheels, whether friction or tooth. Tooth wheels are in gear when their teeth are engaged together and out of gear when separated.

Spur gears are the wheels with the teeth or cogs ranged round the outer or inner surface of the rim, in the direction of radii from the centre, and their action may be regarded as that of two cylinders rolling upon one another.

Bevel gears are wheels the teeth of which are placed upon the outer periphery in a direction converging to the apex of a cone and their action is similar to that of two cones rolling upon each other. When two bevel wheels of the same diameter work together at an angle of 45 degrees they are called Mitre wheels.

The straight line drawn from centre to centre of a pair of wheels is called the "line of centres."

The pitch line, by which the size of a wheel is always given represents the touching of two cylinders rolling upon one another, and is the line or circle on which the pitch of teeth is measured.

The pitch is distance between the centres of two adjacent teeth measured at the pitch line.

Gear wheels are generally constructed of a substance especially adapted for the class of work they are required to do.

Gears which are required to perform heavy work are generally made of hard steel while gears doing light work may be made of brass and in some cases of raw hide.

Raw hide gears are generally used on machinery where it is desired to have as little noise as possible.

A good lubricant for gears made of steel is made of heavy grease containing a large percentage of graphite and ground cork. This not only lubricates the teeth of the gears but adds greatly to reducing the noise.

For raw hide gears the best lubricant is dry flake graphite as oil tends to soften the hide and will cause the gear to become spongy and wear out quickly.

In the case of the raw hide gears on the automobile motor, the gear should be kept free from dirt and washed occasionally with gasoline and new graphite applied. Kerosene should not be used as it soaks into the leather while gasoline will remove all dirt and evaporate quickly.

A motor mis-firing will cause more wear on a set of gears in a short time than many miles of smooth even running as each time the motor mis-fires there is a sudden back thrust on the gears straining the teeth being in mesh at the time.

In some cases two gears of different metals are used, the soft metal being in the gear receiving greatest wear and least expensive to renew as in the case of the steering gear. The worm gear on the steering posts is usually made of steel while the gear attached to the sector is made of brass, the brass gear being more readily and cheaply renewed. The brass gear may be removed without removing the steering post from the car while it would be necessary to disconnect all the steering apparatus, timer and carburetor control leads, to renew the steel worm gear, this being attached to the steering post.

In the gear cases it is absolutely necessary to clean out frequently all old grease and oil in order that particles of steel ground off the gears will not find their way into the bearings and injure them. A broken gear should be taken out as soon as possible as it will soon ruin the other gears. Should a slight knock be noticed it may be traced to a part of a broken tooth which may have become wedged between the other teeth and cause the knock at each revolution of the gear wheel. In detecting trouble of this nature it is very difficult with the motor running, but a simple way is to take a piece of wire, placing one end between the lips, and touch the different parts of the motor and the gear case. After a little patience and practice it will be found that a strange sound can be noticed and you are then near the seat of trouble. A slight difference in the vibration through the wire will be noticed.

In gear cases where gears are considerably worn

from being thrown in mesh the teeth of gear wheels they may sometimes be improved by filing even, which will add to their efficiency and also remove small particles which might otherwise break off and cause damage.

LESSONS FOR DRIVERS.

Carelessness and Ignorance Responsible for Most Accidents.

The accidents this month as reported in the press of the country are appalling. Many of them are due to the dangerous grade crossing, and a large share to the utter carelessness of children who play in the streets and roads. The following are perhaps illustrative of the general run of the accidents of the month.

Four Killed and One Injured.—Near Saratoga, N. Y., three women were killed and the chauffeur badly injured at a grade crossing. This is briefly the chauffeur's story: "We came out of Raceville, down the grade, in the ravine. I started to make the hill on the high speed, and the engine seemed to die down. I was then right near the crossing. I shifted my gear into second, and, just as I shifted, I heard the train coming down on us with terrific speed. I then endeavored to shift into reverse and my engine died. The next I knew they picked me up in a ravine about twenty feet from the crossing.

Besides the steep sharp grade with the railroad crossing in the center, itself a menace to the safety of automobilists, the crossing was made more dangerous by the location of a number of buildings. These stood north of the crossing so that a view of the tracks for some distance north of the road crossing was prevented. Likewise the buildings prevented the engineer or train crew from having a clear and unobstructed view of the road on which the automobile was traveling.

A Joy Ride in a Cornfield.—Near St. Louis a doctor left his car by the roadside while he went some distance to call on a patient. Soon a colored youth happened along and stood for a time watching the machine. After he had carefully looked at the levers and practiced with the "crank" the engine started, increasing his confidence in his own ability to master it. Would he try it? Yes, he would take a little spin up the road and return the machine, and no one would be the wiser. In the light of what followed the young man had more trouble to get the machine stopped than he did to start it. He marked saw teeth in the road for nearly a hundred yards, when the car suddenly leaped across a ditch and entered a corn field. A witness said he made about thirty miles an hour, and in describing two circles around the six-acre field of corn mowed down fully a half acre of the crop. The automobile was brought to a stop only when it collided with a stump. The steering gear of the machine was broken and other damage of several hundred dollars resulted. The doctor says he will not prosecute the boy. He put him to work, thus giving him a chance to pay the damage.

Car Ran Backward.—On Long Island a man with four other persons was driving up a long hill on second speed, but nearing the top he attempted to throw in low speed. The clutch failed to grasp and the car began to run backward down the hill.

The car was near the bottom, when one of the wheels ran into a patch of soft sand and the car turned over. The five occupants were caught under it. Then the

oil took fire. A witness of the accident got a fence rail and pried up the forward part of the machine so that the men could get free. They got more rails and lifted the tonneau enough to drag the women out.

The car was burning briskly, but all hands turned in and the sand which upset the car served to save it. All were more or less injured.

Killed Under His Car.—Lying under his car trying to repair it, a chauffeur was killed in Brooklyn when another car crashed into it. The driver of the on-coming car was blinded by the headlights of another car and did not see the one in the road. This should serve as a lesson to those who stop their cars in the road or street for repair or otherwise, not taking the precaution to get out of the driveway. Again and again we have seen this done, but drivers seem to have the notion that half of the road belongs to them and if they turn half way out it is all that is required. Nothing of the sort, however. The driver of a car is entitled to half the road for traveling, but to none whatever for repairing his car or for stopping for any other purpose.

Started While Cranking.—An automobile dealer of Newburgh, N. Y., was giving a young woman a lesson on running a car when something went wrong and the machine stalled. The instructor got out of the machine to go to the crank in front and was in the path of the car, when it suddenly started. The car was going very slowly. The instructor is a man of vigor and strength and he put his hands against the car and by shoving saved himself until the power could be turned off.

Danger in the Carbide Lamps.—In Salem, Missouri, a lad was lighting, through the vent, the big carbide lamps on his father's car, without opening the doors, when a lamp exploded being full of gas, bursting the door and cutting the young man in the face.

SAM IN A RAILROAD SMASH.

How It Seems To Be Knocked to Splinters and a Good Way to Settle.

From O. H. Hampton, Indiana.—I had not seen Sam for a month, when he came along last evening. He was going past my house without looking my way at all. Of course I hailed him and told him he couldn't cut an old friend like that.

"Come in here and tell me your troubles," said I.

Sam replied that he had not had anything but troubles of late and nobody wanted to have some other fellow's troubles unloaded on them, so he just "sawed wood and said nothing."

"Now here," said I, "I read a little story in the papers some time ago about you running that buggy auto of yours into the Pennsylvania Special in Richmond, and I want to hear from you about it, so tell me all about it."

Sam told the story as follows: "It was at the 12th Street crossing, and you remember that the big shops of the American Seeding Machine Company are so close to the tracks that they cut off all view of trains coming from the right hand. There are no gates at the crossing; just a flag man. As I approached the crossing, the flag man was waving his flag to stop some teams that wanted to cross from the other side of the tracks. This signal was of course the same as if he was waving for me to come on, and as the teams he was waving at were not in sight of me, I took it that the tracks were clear, and as I always thought that when the track is clear, the sooner you get across,

the better, I turned on some more 'juice' and started across at a pretty good clip, at the same time keeping a sharp eye out for anything that might be coming from behind that big shop.

"Well, just as soon as the corner of the shop was passed so I could see, there was the special, coming at 35 to 40 miles an hour; two big locomotives and ten Pullmans. They were not 50 feet away and I was not more than 20 feet from the track they were running on. There was no time to think, but instinctively the reverse lever was pulled back with all the strength of my right arm, assisted by one foot braced against the brake and the rear wheels were sliding. If there had been a single foot farther to go the auto would have stopped clear of the train, but that space was not there and the auto bumped into the tank of the rear locomotive."

Here Sam stopped his narrative and appeared to be thinking about something a thousand miles away. Presently I told him to go on with the story and he resumed but seemed reluctant to do so, and I asked him what was the matter. He finally said: "I don't like to think about it; wish I could forget all about it."

"Well," said I, "finish the story and then forget it."

"Yes, I will," said he, "but seeing all those splinters and things a whole flock of them flying in the air, sort of upset me. The front end of the machine being just like the front end of a buggy the wheels got it first and they went up into the air in a cloud of splinters, then the front end of the machine dropped to the ground tipping the machine forward so the dash and front end of the body fell against the coach steps and there were more splinters flying."

"Where did you find yourself when it was all over?" I asked.

"Found myself sitting on the seat, my right hand holding the reverse lever, my left hand holding the steering wheel and one foot pressing the brake pedal. It was all over so quick that there was no time to let go."

"It must have given you quite a shock and I don't see why you were not thrown out, nor why your machine was not upset," said I.

"Why," said he, "that train was going so fast that it did not 'slew' the front end of the machine to one side more than three feet. I did not feel the least shock nor any sensation of fright. My mind was still intent on the desperate effort to stop the machine. By the time I had got out of the machine people were running from every direction; hundreds of them. I can't imagine what makes a certain portion of humanity so crazy to see anything of the kind; must be the same sort of idiosyncrasy that makes certain people (mostly elderly females), anxious to go to every funeral they hear of—just to see how hard the mourners took it. By the time fifty or so had arrived I found I was not hurt and never felt better in my life. You can bet I just felt jolly good over finding myself 'all there,' and I turned to the crowd and said: 'Gentlemen, you are a little too late; the show is just over, I am sorry to disappoint you, but this is positively my last appearance in this role.' The train had been stopped as soon as possible and the conductor came back with a yellow book in one hand and a pencil in the other and began to ask a lot of questions—my age, married or single, age of my wife, how many children and their ages, all proper enough perhaps in a case of personal injury, but I found them annoying under the circumstances, so I said: 'Excuse me, but it sounds pretty damned fresh for a perfect stranger to be in-

quiring so closely into a man's domestic affairs,' and the crowd laughed, and one of them said, 'Well, if he ain't the cool one now!'

"But we have to ask these questions," said the conductor. 'All right,' said I, 'ask as many as you like, but I am going to lunch right now, and you can answer the questions to suit yourself.' With that I left for lunch. A man walked along by my side and said, 'My friend, may I give you a little advice?' 'Am afraid it is a little late,' said I, 'but go ahead.' He said: 'Now the first thing you want to do is to see an attorney.' I said: 'I don't know you from Adam's off ox, but it is a good guess that I am seeing an attorney when I look at you. Is it a good guess?' 'Yes,' said he, 'it is a good guess, and I want to tell you—' 'Don't waste a word,' said I, 'no lawyer is going to get a smell of this pie. Go your way in peace for if you don't perhaps you may be hauled away in pieces.'

"The next man who wanted to say something remarked: 'I saw the whole thing; you have a bully good chance to make something out of this; sock it to 'em for all you can get!' and so on and so forth."

"What did you do about the damage matter?" I asked.

"Just got the machine repaired as soon as possible, and sent an itemized account of the repairs and a statement of the accident, giving full particulars, to the railroad company's claim agent, and within two weeks received the company's check for the full amount claimed."

"Had any auto troubles since then?" I asked.

"Well, I guess yes. And I can tell you from personal experience that hunting trouble in an auto is like hunting a needle in a hay stack. Just the other day one cylinder got to missing when the engine was running slowly, but when running fast there was no missing; you can imagine how hard it was to get into high gear with that sort of a missing trick. A number of times I tried it by getting a good start on slow gear and then tried to get into high, but it was the same old thing, and I couldn't find it. Of course the fault was expected to be found somewhere in the ignition. I tested the ignition by making contacts between the ends of the timer wires and the crank-case and got the answer every time, and I also got a jolt that showed the dry cells were still lively enough to make me be careful not to let them jolt me again. There was nothing for it but to proceed on slow gear until descending a steep hill gave a chance to get up a good spurt of speed and then when the high gear was turned on there was not another miss, and for the next ten miles there were no misses, for the engine was kept at top speed all the way, and then home was reached."

"Next morning I went over everything without finding the trouble. At last, because there was nothing else that had not been examined, the timer was opened and the trouble was very plain. The timer is of the roller type, the roller being at one end of a bar that is pivoted near the middle of the bar and the other end of the bar is attached to a spiral spring which keeps the roller always pressed against the interior circumference of the timer case. This pivotal pin had lost out so there was nothing to hold the bar but the spring and the bar could swing about almost any way. When the roller was passing the contact at the bottom of the timer case, gravity brought it into contact and the spark was made, but when passing the contact at the upper side of the timer case, gravity kept the roller from touching the contact, but if the engine was running fast enough, centrifugal force swung the roller up against the contact plate and there was no missfire."

"Take it from me that an auto can study up more meanness, and do it in the slyest way of anything on earth. The devil is said to be mighty smart and shrewd, but I will bet that any old auto can give him cards and spades, and never let him get a game. Lots of things happen that are easy to fix; the trouble is to find them. When that timer was found to be bad it only took five minutes to find a wire nail of the right size and saw it the right length for a pin and rivet the ends so it would not come out again.

"My mother-in-law died some time ago and left my wife a bunch of money and she says she is going to have a six cylinder machine. I tell her that goodness knows two cylinders can make trouble enough for any two men and that six will be beyond me. She says all the best people are getting sixes, and that next year nobody that is anybody will have anything but sixes, and she says I need not bother about it for she is going to have a chauffeur, too. Well, but won't I have a good time? First thing will be to just loaf and take it easy, and smoke and go fishing with Bill Johnson in his auto, and he will do the greasy clothes act while I will wear the clean clothes and encourage him while he gets under the machine to fix the 'blawsted' thing."

COMPRESSION AND EXPANSION.

And Something That Will Further Explain the Vagaries of Adiabatic Pressure.

BY JAMES F. HOBART, M. E.

Friend Betsey Bobbett, New York, in the June issue submits something along the expansion line which is very warm indeed. I want to get this adiabatic and isothermis business fixed just right with everybody for if the two are not very fully comprehended, there will always be trouble with both of them.

Isothermal and adiabatic compression may well be compared with a hungry man eating his dinner. When the man eats and keeps eating without filling up, that's isothermal compression, for the man can't do it. When he expects to sit at the table and fill up without eating much, that's adiabatic compression; that kind where things swell up by the heat they have within them. The man eats little but what he does eat, not only fills up a little of the emptiness, but that little which he eats expands under heat and fills up more space than before it was eaten. Or if there is no more space to fill up as in the case of gas in an engine cylinder, it exhibits the effect of the internal heat by going under greater pressure.

The adiabatic man is on the right track. He eats little and chews much, and that little and much does him more good than if he crammed himself in the useless attempt to eat everything before him and not get full.

Perhaps Fig. 1, may assist in an understanding of adiabatic compression. In this sketch, the bottom line A B, stands for volume—a cubic foot or a cubic inch or some other quantity. The vertical line A C, stands for pressure—a pound, ten pounds to the square inch, or some other amount. No one knows or cares just how much. It is enough to know that a certain engine cylinder contains a charge of gas which has a volume A B, and is under pressure A C.

Then up comes the piston of the engine and pushes the charge into one-half the space it occupied before, as shown by the line A D.

As nature is strictly upon the square and never gives something for nothing, we cannot compress some of

her gaseous matter without increasing the pressure in the exact ratio that we decreased the volume of the gas. Therefore, when the volume is pressed in from B to D, the pressure will and must double exactly as the volume was halved; hence the pressure will rise from C to E. This is isothermal compression pure and simple; halve the volume and double the pressure. Very simple matter, that isothermal compression, but like the man eating without getting filled up—why, it usually can't be done. When the pressure rises to E, from C, the gas under compression is found to be getting warmer and, as warming gas expands it about 1-490 of its volume for each degree of heat. so, having reached the pressure E, it is found that the heat made visible by the reducing of volume, has been taken up again in the form of increased pressure which raises the pressure line to F.

Thus we see that isothermal compression just shuffles around between decreased volume and increased pressure, while adiabatic expansion also pushes up the pressure due to volume reduction, and in addition,

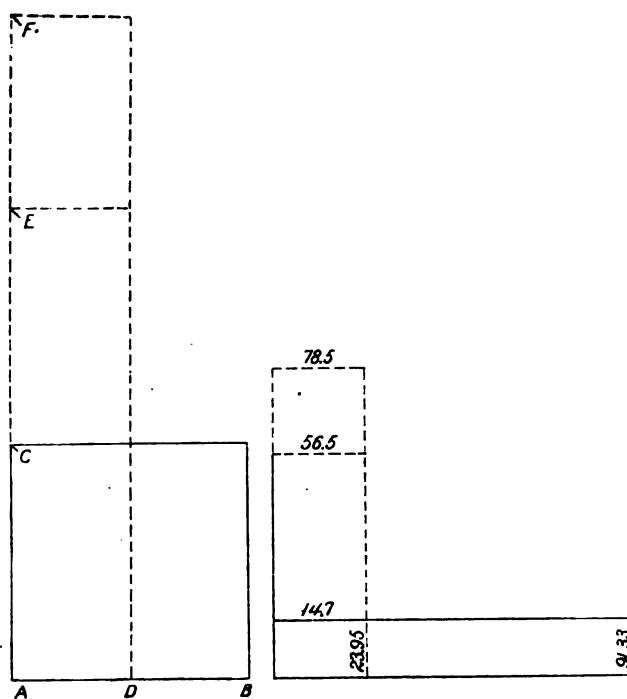


Fig. 1—Pressure and volume

Fig. 2—Cylinder Compression.

pushes up the pressure another notch as the result of the increased temperature visible when the gases are compressed.

One might say that the gas has a certain amount of heat contained in it for each cubic inch of volume and when the gas is squeezed into one-half that space, one-half the heat is forced out of house and home and makes itself felt by raising the temperature of the diminished volume of gas enough to raise its pressure to F.

The scientific man will a whole lot about the heat thus set loose, or made visible, as being equal to the work done in compressing the gas, but we won't talk about that just now. We will try and find out just how adiabatic compression behaves when it gets hold of Betsey Bobbett's engine cylinder.

In Fig. 2, let the lower oblong figure 91.33, represent the area of the cylinder of that engine and then let the piston come forward and push the gases before it until they are all inside the clearance space at the line 23.95. When the compression takes place, of course the pressure goes up and it continues to rise

smoothly and not yield to sudden impulses which cause it to travel in an irregular line.

Mr. Pembroke's remarks concerning leakage, are pat and to the point. It requires but a very slight opening into the cylinder to steal away most of the compression. There is a way of figuring what such losses will be and the writer will give it in these columns if requested to do so by the readers. As stated in a preceding paragraph, leakage of gases and loss of heat cause the loss of compression from what it figures, to what Betsey Bobbett found with the "compression box."

Mr. N. M. Baldwin, Connecticut, in replying to "Betsey," page 59 of the July issue, also gets mighty close to the truth as far as loss of heat is concerned, but he does not mention the probable loss by leakage. It is stated by him, that about 440 degrees F. would give about the required pressure. There is something right here, regarding this temperature and expansion business which every reader should sit up and take notice of, and that is, the relation between temperature and expansion as briefly mentioned by Mr. Baldwin.

When the engineer figures with the expansion of gases by heat or the rise in pressure occasioned by heating confined gas, he takes a far different zero point than we are accustomed to deal with in stating weather conditions. Then, we say "zero," or a number of degrees above or below that point. In the heat engineer's calculations, there is no such thing as "below zero" for he uses a zero point about 460 degrees below the zero marked upon a Fahrenheit thermometer. The engineer does the same thing when he is calculating steam problems. Then, he does not take the pressure as indicated by the steam gauge, but he goes 14.5 pounds per square inch below that point for his "absolute."

That point can be determined quite easily by removing all the air pressure from an opening one inch square and weighing the force required to pull a nicely fitted plate from that opening. It will be found about 14.5 pounds, according to the level of the barometer when the test is made. But it is impossible to work up to such a degree of intense cold as will reveal absolute zero. The scientists have succeeded in producing a temperature of about 400 degrees below ordinary zero, but there they are "stuck" and have to calculate the position of absolute zero, when they want to locate it.

Readers of this journal can easily make the calculations for themselves and the method employed and knowledge gained thereby will be of great value in the study of compression and expansion problems. Fig. 4, illustrates one method of determining absolute zero and the scale given at the bottom of that engraving is the one used in drawing the diagram in question.

First draw the horizontal line O, which represents the zero of the thermometer. Then measure up 32 by the scale and draw line C C, which represents the line of freezing and melting—32 degrees. Make line C D just 1 long. This line now represents 1, in volume, just as the lines were used in figures 1 and 2.

Next, measure up 180 degrees further, to line BF, which is drawn to a length of 1.3665, and represents the volume of 1, after its temperature has been raised 180 degrees, or from the ice melting to the boiling point. Dot in the line DG, and we have a triangle DGF, 180 long by .3665 wide. It can be proved by geometry that the little triangle DGF is of exactly the same proportions as the large triangle ACD, except that the sides are longer. The angles, however, are the same in both.

And it can also be proven that if the loss of 180 degrees of heat will shrink the volume from 1.3665 to 1, that it will require a loss of a proportional number of degrees of heat to shrink the volume from 1, down to 0, or nothing. By geometry, the mathematical sharp finds that:

$$\frac{AC}{CD} = \frac{DG}{GE}, \text{ also that } \frac{AC}{CD} = \frac{DG \times CD}{GE} = \frac{180 \times 1}{.3665} = 492 \text{ nearly}$$

And as $492 - 32 = 460$ degrees, the distance of absolute zero common zero.

The ordinary man in figuring this problem would say: as .3665 requires 180 degrees to diminish volume in, then 1, would require

$$\frac{1}{.3665} = 2.7284, \text{ and } 2.7284 \times 180 = 491.11, .3665$$

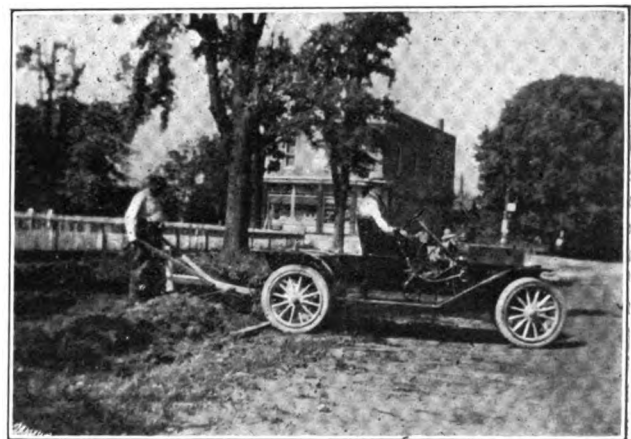
or about 492 should the fraction be carried out far enough. Now, taking away the 32 degrees from freezing to common zero, there remains the 460 degrees down to absolute zero where no heat would remain in the substance (gas) under test, therefore no further reduction in volume could be possible.

The above is one method of discovering absolute zero, and a study of the above will open a way to the comprehension of many a valuable bit of knowledge regarding the behavior of gas in the cylinder of an automobile engine.

New Use for an Automobile.

From Alvy Jay, Indiana.—Find enclosed a photograph of Dr. Yoke and myself filling a sewer with Dr. Yoke's E. M. F. 30.

I have a Model O White steamer. I have read with much interest Mr. Frederick L. Smith's article on the



steam car. If White steam car operators would read it and heed its advice I think they would all get there and back again. I have handled steam machinery all my life and this is my second White. Mr. Smith's instructions are the best I have seen and they have been experienced, but they are stated better than I could have written them.

The tire equipment of the motor cars in use in New York City costs approximately \$27,000,000 yearly.

Automobiles in New York City consume yearly \$10,000,000 worth of gasoline, oil and grease.



This department is intended to be a "trouble clearing house," and it will be esteemed a favor if our readers will add information to it from their own experience or knowledge. Inquirers will please write plainly and give full particulars of their trouble, stated as clearly as possible.

607

Use of the Spark Lever.

From C. S. Miller, Washington, D. C.—I drive a 1910 E. M. F. Can take it wherever I want to go, and am not having an undue amount of any kind of trouble. But I feel that I have a great deal to learn yet, in order to get the best service and satisfaction out of my car. I need more light on the use of the spark lever. I retard it when I crank the engine and when the engine is started I advance to about three-fourths position and leave it there until I find it necessary to retard in going up a steep grade. But I am a very slow driver, seldom exceeding 12 or 15 miles per hour, and since I have read the article on the green driver on page 50 of the May number of your paper I am beginning to believe that I should retard the spark a good deal more than I do to get the best results with my slow driving. It occurs to me that possibly I will not get the engine as hot as I do now if I retard the spark more. Will you kindly enlighten me, or advise me where I can find the information I need?

My experience seems to indicate that when it is necessary to use the intermediate gear in order to make a very steep grade the spark should be retarded rather than advanced. Am I right in this supposition?

Reply.—The reply to A. G. Stanley, Pennsylvania, in this issue may help you. If you will follow your engine speed with your spark lever, advancing it as the speed increases, and retarding as the speed decreases, and are able to get the knack of it, we think you will have no trouble. Your engine will heat up if the spark is too late, and for this reason it is always better to have it occur as early as possible without hammering. When in intermediate the engine runs faster than when in high gear, consequently the spark should be then advanced, rather than retarded.

608

Cylinder Oil with the Gasoline.

From Guy Butler, Nebraska.—I know a man who drives an E.M.F. car who puts about a quart of cylinder oil into every ten gallons of gasoline that he burns and he says he gets lots more power, less carbon and his car runs better in general by so doing, and I want to know your opinion on this matter. Do you consider it a good plan to use the oil as he does? If so, why?

Reply.—In any four cycle engine using cylinder lubricators, we advise the use of one pint of cylinder oil to ten gallons of gasoline. This gives positive lubrication to the cylinders and pistons, the oil on the induction stroke being deposited evenly over the entire cylinder wall above the piston. Oil in the gasoline will not lubricate the crank pins and main bearings. Splash lubrication when used for cylinders as well as crank pins and main bearings, that is with no separate cylinder lubricators, cannot be improved upon by adding cylinder oil to the gasoline unless the level of quently even then it may be necessary to put in de-oil in the crank-case is materially lowered, and reflectors to prevent the oil from being slashed against

the cylinder walls resulting in over lubrication, carbon in the cylinders, smoky exhaust and possibly trouble with the authorities having to do with the enforcement of smoke ordinances. Oil in the gasoline is the most positive method of cylinder lubrication. It takes less oil to do the work and we think will be found to give greater efficiency than over lubrication, one of the serious defects of many engines.

609

Missfires When Run Slow.

From O. J. Bakken, Wisconsin.—I have a Model 10 Buick and I would like if you could tell me in your next issue how I can stop my engine from missfiring when running very slow. It runs fine when you have the throttle about one-third open, but when I have it shut more than that it will miss. I have tried to regulate the carburetor but cannot stop this.

Reply.—If your exhaust valve springs are not sufficiently stiff to keep the valves on their seats with the throttle nearly closed, burned gas from the exhaust will enter the cylinders to relieve the partial vacuum therein. This is the reason that the exhaust are usually heavier than the inlet valve springs. Your trouble is very likely from this cause, although the magneto may not develop quite enough current when the engine is running slowly.

610

This Engine Hammers.

From A. G. Stanley, Pennsylvania.—I have had no end of trouble with my Reo runabout in changing from high gear to low. Going up a little hill the engine labors and hammers. I have tried everything to stop it without avail. Some say I am using too much gasoline, and others that I am not using enough. I have had the carburetor adjusted, the flywheel tightened, and in short tried everything I could think of. I must depend upon you as a last resort, and trust to hear from you shortly.

Reply.—The laboring and hammering is probably caused by preignition, due to carbon in the cylinders, or to too much advance to the spark. It should carefully be borne in mind that the principle of the "lead" to the spark is to secure ignition at just the proper instant. The higher the engine speed the earlier the spark should occur, and conversely the slower the speed the later the spark. When running the spark should rarely occur after the center is passed. A knock caused by too much gasoline can be proven out by reducing the amount or increasing the air. Loose flywheels give results such as you describe.

611

Oil with Gasoline for the Cylinder.

From Reader, New York.—I have a drip cup on my engine with two openings, one for each cylinder, in which we put lubricating oil. This cup drips into each cylinder about 15 drops a minute. They tell me to mix the oil with the gasoline in the proportion of about 1 quart of lubricating oil to 6 or 7 gallons of gasoline, and do away with the drip cup. The cup may sometimes choke and the cylinders get no oil for a turn. When it is mixed with the gasoline the lubrication is positive all the time. If it is a good thing to do this on a motor boat, why not on automobiles? Did you ever have any experience with this method of lubricating cylinders?

Reply.—The proportion of one quart of oil to seven or eight gallons of gasoline in our opinion is a little too heavy. One pint to five gallons seems to be the proper amount. This would give ten gallons of gasoline to one quart of oil. The Chase Motor Truck Co.,

Syracuse, N. Y., uses this proportion, we understand, in their two-stroke-cycle motors, and have done so for two or three years with no question of its infallibility to properly lubricate not only cylinders, rings and pistons, but wrist and crank pins. For motor boats and automobiles using two-stroke-cycle motors, to our mind, it is the "best ever." For automobiles and motor boats using four-stroke-cycle motors with independent cylinder lubricators, a proportion of one pint to ten gallons may be profitably and safely used, but there must be some means of lubricating the crank and wrist pins as the gasoline and oil with it never enter the crank-cases of such motors. If the motor is lubricated solely by "splash," that is oil in the crank-case, do not put oil in the gasoline.

612 Running on Low Gear.

From N. H. Harrison, Macon, Mississippi.—Sometimes on the southern roads we come to stretch of rough road about one-half mile or longer. With the spark fully advanced and gear lever in high you can not run as slow as you wish. Is it better to retard

Reply.—You should never run engine slow with spark fully advanced. It is better to retard the spark, but we think you will rarely have to carry it much after the spark very much and run in high or cut down to intermediate and leave the spark well advanced? What I wish to know is which is better for the motor? the center, throttling the engine closely. Cutting down to intermediate would increase your engine speed and cause additional wear in your transmission. A good rule to follow is to run on high gear whenever possible.

613 Timing Information.

From D. A. Jamison, South Dakota.—Please give me through your Trouble Department the number of degrees before dead center that a gasoline engine should fire at when running 300, 400, 500, 600 and 1,000 revolutions per minute to get most power and best results. Also how many degrees before outer dead center should the exhaust valve open at the above number of revolutions per minute?

Reply.—The engine should be so timed that the charge of explosive gas will begin to expand just as the center is passed. Timing is affected by the lag of the coil or magneto, and should be earlier for make and break than for jump spark ignition. No two manufacturers seem to time their engines alike for same speed. As a guess we would place the minimum spark lead at 5 degrees and the maximum at 45 degrees, the former at 300 revolutions and the latter at 1,000. Some marine engine manufacturers do not give any lead to the exhaust valve when running at 300 to 400 revolutions. If the valves are very large they claim fuel economy results, in that a higher mean effective pressure is obtained at a lower consumption of fuel. Others open at the low speeds, say under 400, anywhere from lower center to 30 degrees. At 1,000 revolutions some engines, especially if the valve areas are small, open 40 to 50 degrees or more before the center. There are no empirical rules for timing ignition or exhaust valve openings. Each individual make of engine has features which limit and circumscribe results.

614 Two Cycles, Vulcanizing, Etc.

From Dr. J. C. McCandless, Illinois.—Wish you would describe best ways to repair tires, small and

large injuries. Does vulcanizing tubes impair wearing properties? How much good oil for lubricating is generally needed for seven passenger 30-50 h.p.? How far should a gallon run? How many miles to a gallon of gasoline? What is a good brass polish? What is a good body polish? You can answer these questions in an early issue. I have a valveless Simplex and don't seem to need much repairing, but your journal contains much valuable information.

Reply.—Unless you are well equipped and have had practical experience we would not advise you to attempt to repair shoes and tubes. Over-vulcanizing tubes would naturally impair wearing qualities. The manufacturers of the Amplex car will probably give you full information in matter of gasoline and oil consumption, and proportions. Your engine being of the two-cycle type, needs about twice as much oil per gallon of gasoline as would a four-stroke-cycle engine. The usual proportion for the former is one pint of oil to five gallons of gasoline and one pint to ten gallons for the latter, when lubricating oil is mixed with gasoline, a custom that many marine gasoline engine manufacturers have lately adopted with very best results. We have no means of telling how far a gallon of gasoline should run your car, but judging from the increased gasoline consumption of two-cycle motors over those of the four-cycle, we hazard a guess of seven to eight miles. Averaging $7\frac{1}{2}$ miles, one gallon of oil should run you 60 miles, lubricating cylinders, crank and wrist pin only, providing the main bearings are lubricated by means of grease cups. Brass and body polishes are being advertised in all automobile publications and can be bought at any reputable garage or supply house.

615 Carbon Makes Trouble.

From E. E. Weigel, Nebraska.—I own a Buick 1910 model. Have had trouble from preignition caused by overheating. It is not due to a surplus of carbon, but as I believe to a too limited radiating capacity or as suggested by the Trouble Department to late timing of the valves. Could this last suggestion be the cause? If you decide too late timing to be the cause, explain how to advance the timing one tooth or more.

I drive with an advanced spark and kerosene and clean my piston heads every fifty miles. Nevertheless I can boil the water on a warm summer day going the first mile. Have a six bladed fan working all right. Have driven this car one year. Had one puncture in 4,700 miles. It has never become so hot that the pistons stuck, but I dislike the igniting after the switch is turned off. There are three cars of this model in my neighborhood and all are troubled the same way. Is not overheating a feature of this model? Since you might not like to answer the last query through the Trouble Department, please answer this letter privately.

Reply.—Competition in manufacture of automobiles often leads designers and others responsible for adopted models to cheapen cost by using radiators of very least radiating capacity. The margin is, therefore, often very slight. It may be so in your case, and conditions have to be about perfect to prevent overheating and resulting pre-ignition. We are not prepared to say whether or not overheating is a feature of this model and beg to advise you that all questions asked us are answered publicly. We make no charge for the service, but what you ask and we answer may be equally as interesting to hundreds of our readers, as to you. This amply repays us.

616

Engine Heats.

From F. F. Raubach, Nebraska.—I have a two cylinder, 14 horse power, 1908 model Maxwell which heats very badly, otherwise the car runs very fine. Have gone over all the circulating system. The valves are all good and have just cleaned the carbon out of the cylinders. I am using what they claim to be a good oil. When I got the car the oiler was full of oil and with that it did not heat, which I think was Vacuum A oil. I think the whole trouble is in the oil. Am I not right?

Reply.—With a car three years old it is quite likely that an oil of heavier consistency would prevent heating. The reason for this lies in the fact that leaks past the piston and rings which might be materially reduced by a thicker oil would cause an additional consumption of fuel. The lower part of the cylinders and crank-case would heat up and and this added to the extra heat resulting from the increased consumption would be likely to cause overheating.

617

Clutch Trouble.

From Carlton Farley, Iowa.—I have a Flanders 20 which I have owned about one year. It runs fine except the clutch, which does not work well. I have read considerable about slipping clutches but have never read about one that would not release. It works very well when the motor is cold, but after running awhile it is almost impossible to change the gear. Would like to hear something in regard to the remedy.

Reply.—Your trouble may be that the clutch slips a little when the engine is cold and then "seizes" as the friction heats it until it is hard to release. If the fly-wheel heats up after running two or three minutes we are inclined to think your clutch slips at the start.

618

A Slipping Clutch.

From Carl Eckhardt, New Jersey.—I am the owner of an Orient runabout automobile which persists in becoming overheated and stopping every mile or two which I drive it. My mixture is perfect, but I have no cooling fan, although our local machinist said that it being air cooled it should not heat up without a fan. It heats up clean to the very crank-case. Now can you please tell me how I can possibly prevent this? No carbon in my cylinder either as I cleaned it yesterday.

Reply.—A cooling fan would help keep your motor cool, just as blowing hot coffee cools it so you can drink it. An air-cooled motor should use a thicker cylinder oil than a water cooled, and needs rather more. Consult the July Automobile Dealer and Repairer, Trouble Department, for causes of overheating.

619

Water Boils in His Rambler.

From S. W. Houchin, Maryland.—I notice that No. 567, L. A. Maxfield, Michigan, has trouble with a Rambler high speed clutch slipping. I have been there; new leather was put on but still it slipped. Took it apart myself and found the copper rivets used to hold the leather on were just flush with the leather and very bright. I countersunk all these rivets into the leather and there was no more slipping on high gear.

I am having trouble this year with my Rambler. On only a short run it gets hot and boils the water and loses power on hills. When I first start out I can take them on high gear, but after a few miles have to use low on hills and sand. On a level hard road it runs fine, and quiet, but a little hill or sand causes the

engine to labor, and jerk. The engine wants to go but something seems to hold it back, as though sparking too soon, but it sparks just before the center and changing that, even a little, causes loss of power. Cutting off gasoline at carburetor does the same as also does giving more air. The whole engine gets hot and boils the water. There is no carbon and all valves are tight. Have good hot spark in the plugs; there is only a little thing wrong, but I cannot locate it. Kindly help me.

Reply.—If the rivet heads are not properly countersunk it could not be called a good job. The leather only should come in contact with the taper of the flywheel.

In your case it looks as though your water circulation at slow speed was not perfectly free. The cores in the cylinder jackets may not have been entirely removed. See Trouble Department in July Automobile Dealer and Repairer.

620

Cause of an Explosion.

From George E. Dyson, Missouri.—As I am a subscriber and take great pleasure in reading many of the interesting articles that are printed therein relative to automobiling, I thought it would not be amiss to inform you of an experience I had with an acetylene generator.

I had been having trouble with poor lights and endeavored to clean the generator thoroughly and removed the same from my machine, took it all apart, including the stop cock; also drained the water tank of all the water and there remained a very small amount in the tank. This I tried to get out by turning same upside down, but as it did not come out, I shook that part violently and a terrific explosion resulted, which blew out the surplus water that remained in the tank, through the filler hole.

Now this was done in broad daylight; generator had not been used; there was no one smoking, no fire near nor anything to cause this explosion, and I will ask you or your readers to explain what caused the same and why there was an explosion out of the water tank of the generator, which does not carry any gas.

I have talked with a number of automobilists regarding this matter but have not found one to give me a plausible explanation; hence I appeal to you as authority.

Reply.—The rapid formation of gas due to the contact of water and carbide formed pressure within the inverted tank, and its only exit was through the open filler hole. The gas did not burn as there was nothing to ignite it.

621

An Ideal Spark Plug.

From P. E. Zimmerman, Kansas.—In the questions and answers of your next issue, will you kindly describe in detail:

- 1.—What constitutes the ideal spark plug?
- 2.—What is the advantage of porcelain over mica, or vice versa?
- 3.—What is the correct alloy for electrodes?
- 4.—What constitutes the ideal gasket?
- 5.—In other words; what are the obstacles to be overcome in the construction of a perfect plug?

Reply.—An ideal spark plug would be one with a porcelain that would not crack, or a mica packing that would not be porous, a plug that could be made tight without any gasket, the electrodes being made from irridio-platinum. Such a plug should sell for not less than \$5 with irridio-platinum at over \$40 per ounce. Having perfected this plug as far as materials

and workmanship are concerned, devise something that will keep carbon from collecting upon it and you have it.

622 **A Short Circuit.**

From R. K. Wright, Missouri.—I have a model D. Maxwell car which I am having trouble with. If I run with the left cylinder there is a sharp knocking sound and when I disconnect the left cylinder and run with the right there is a sort of a dull thud sound. Otherwise the engine seems to run as smooth as ever. In the ignition part it sparks in both plugs at the same time, both on battery and magneto, which is model G. Splitdorf magneto and vibrating coil of the same make. I had the spark coil sent to the factory, but it does just the same since it came back. There is, as far as I can tell, nothing wrong with the timer and it is connected up according to Splitdorf's instructions for wiring. The car seems all right on the road but sometimes it will stop dead still and after standing awhile it will start off again. Kindly give me information.

Reply.—Short circuit in the secondary wiring or the distributor on your magneto. See July Automobile Dealer and Repairer, Trouble Department.

623 **Carburetor Trouble.**

From L. B. Zimmerman, Pennsylvania.—I have a Regal 30, 1910 Model automobile equipped with a Schebler carburetor which does not work satisfactorily since I have had the car. If I drive on a level stretch of road on good speed and then throw off the gas for a while, and then open the throttle gradually it checks the motor and sometimes would stop it if I would not open the throttle altogether so the gasoline can escape, then if the gasoline is out it works all right and makes good power again. When I stop the motor the carburetor will overflow and gasoline will run out of it for a while. If I stop the car for a while and let the motor run, and then when I want to start again it will not work until I open the throttle altogether again. I bent down the float and also took it out, dried and painted it with shellac, according to directions, but the motor runs the same as before. Would you please advise me what could be done to remedy same?

Reply.—The float valve of your carburetor may leak and may need regrinding. Remove the cap over the float valve, put a nail set or small piece of round steel directly on top of the needle valve which you will see in the center of the hexagonal retaining nut, and tap it lightly. If this does not remedy the difficulty get some mechanic who knows how to grind it in with powdered glass and oil. If, when the float valve is tight, the trouble does not disappear, the carburetor is too large for the engine, or not properly adjusted. There is not vacuum enough formed in the air passage to properly vaporize the gasoline which latter condenses and runs back to the carburetor. The opening for "fixed air" is too large.

624 **May be a Rich Mixture.**

From H. J. Buckmaster, Ohio.—I have a two-cylinder motor and the rear cylinder misses fire when the motor is running slow. When I open the throttle it takes hold and goes good, but just as soon as I close the throttle it does not fire every time. I have tried everything I can think of but still it is as stubborn as ever. First I ground the exhaust valve; no better. Then I adjusted the carburetor; still nothing doing. Then I went over the ignition, nothing wrong

there. Plugs are good; commutator is fair, a little loose on bearing, makes fair contact; switch O. K.; engine in time; piston rings good; 60 lbs. compression in $4\frac{1}{2} \times 5$ cylinder; wires all good. If you can tell me what the matter is I will be very grateful. I have had no trouble with her until this week. Can you tell me in regard to turning piston rings? Do you make the ring the same diameter on the outside as the cylinder on the inside then cut the ring and let it expand? Or do you make the ring a little smaller than the cylinder? What is the best material to use for rings? Please answer in your next issue.

Reply.—If your engine is a double-cylinder and explodes twice every revolution, it has one complete revolution without any explosions. It is barely possible and quite likely that the mixture is richer in the first than in the second cylinder. This is not unusual. To prove whether or not this is the case, adjust your carburetor to get more gasoline or less air. This should result in getting more regular explosions in the missing cylinder and missing in the good cylinder. We presume, although you do not so state, that your motor is of the four-stroke cycle type.

Piston rings should be of close grained cast-iron turned slightly larger than the bore of the cylinder.

625 **A Question of Cams.**

From C. L. Wilson, Pennsylvania.—I am enclosing a sketch of the shape of the cams on my engine, which is air cooled, 4×4 stroke and bore. The thing I want to know is what size to make my cams and have the valves open right. Now they open with the exhaust right on the top center and close on the bottom center. The intake opens on the top center, and closes one inch before the bottom center. What I want is that you give me the right width for new cams at the top and bottom of the same. The engine has never run right. I have tried changing the gear but cannot get any better results.

Reply.—You do not give us the speed at which you desire to get the greatest power. The valves are always timed on up-to-date motors for some prearranged speed. See reply to inquiry of D. A. Jamison, South Dakota, in this issue, also illustrated article on cams by A. E. Potter. We think you are slightly mixed when you say they "exhaust right on the top center and close on the bottom center." Don't you mean just the reverse?

626 **His Franklin Car Trouble.**

From W. E. F., Pennsylvania.—I have a 1908 Model D Franklin car, and I have had trouble lately on keeping the motor from running hot since it was overhauled in the early part of April. They now tell me the pistons, cylinders and rings are worn too much, etc., that the engine is practically worn out, which I cannot believe, because the power is too good and the motor does not miss fire. I will give you the symptoms: Last winter and spring the motor had a knocking sound, especially if the car was run faster than 20 miles an hour, but it did not miss fire and the power was good; it did not heat nor use an excessive amount of oil or gasoline. In April I had this motor thoroughly overhauled and new one-half bearings put into the crankshaft, lower half, which were badly worn and allowed the fore and aft motion of the crankshaft. They found the valves, timing, gears and other bearings worn, but not considered unusually so. All bearings were taken up, valves ground and timed and motor assembled. She then had only a slight knock, due to the back-lash of the cam shaft gear. The crank-

case was full of oil and the motor ran fine, showing a great deal more power than before. I kept plenty of oil in the crank-case for a week or two and then allowed the oiler to feed plenty, feeding 7 to 8 drops. Since then, whenever I take a trip of over a few miles (unless I put a quart of oil in the crank-case, when it will run about 20 miles), the motor loses power rapidly, especially on the hills, while when I start she carries her load up a good grade without complaining. When she heats up, the first thing I notice is a clicking noise and the loss of power. It does not get so hot it will stop if I continue, but I must use my low gear for ordinary grades and the clicking becomes annoying if the motor is forced. The motor was overhauled by skilled mechanics in the work, they having worked on a number of Franklins before. While they had the motor torn down they prophesied I would again have a good motor, and it is only since she overheats that they say she is badly worn. I cannot understand why this should come on so suddenly. Kindly give me the symptoms of a motor which is warped and that the cylinders and pistons do not fit. I saw the rings of my motor and they had a few small black or darkened marks or spots; that is, it did not show an excessive loss of compression.

Reply.—We are inclined to believe that your cylinders and pistons are badly worn. The piston rings should have shown absolutely no black or darkened spots. Use an oil of considerably thicker consistency. It may help you some; oil that is suitable for new water cooled motors is manifestly unsuitable for old air cooled motors. Any appreciable loss of compression is to our mind excessive, or will be very soon.

627

Timing the Valves.

From A. B. C., New Jersey.—I have a Buick Model 10. It has never given me any trouble until I took it down to clean, and when I put it together, the timing of the valves was wrong. There are three marks on the fly-wheel for timing the valves, but the mark which indicates inlet open seems to be wrong. If I should set the inlet valve according to that mark there would be no play between the push rod and valve stem. Kindly tell me how I can time the valves correctly.

Reply.—The reply to George M. Thomas, Jr., Kentucky, in this issue will answer your query quite fully.

628

Oil Trouble

From George E. Greene, New York.—I am a regular subscriber to your magazine. I have been troubled this summer with the non-fluid grease foaming in my transmission, the transmission being in a large chain drive car. I used Koo and Kooo non-fluid, as well as another non-fluid grease that I had. I never had any of this trouble before and I wonder whether it comes from the mixture of the non-fluid greases. In the spring I took up a little thrust motion with a washer. The shafts of the transmission run in annular ball bearings. Am I liable to injure the transmission? What have you to suggest?

Reply.—Some transmission lubricants are purely mineral, while others are combinations of insoluble soaps, mineral, animal and vegetable oils. The purely mineral non-fluid oil, Koo and the heavier consistency Kooo, we do not believe will ever foam, as they are claimed to be (and we believe it to be true), purely mineral products. Thin washers to take up thrust can do no harm, providing there is the least bit of clearance.

629

Carburetor Trouble.

From A. J. Dunbar, Illinois.—I am stuck and would like you to help me out. I bought a two cylinder runabout named Marvel, overhauled it and found it in good condition. But it will not start without priming each cylinder. After I get it going, it runs perfectly. It has a Schebler carburetor. Will appreciate any information you can give me.

Reply.—Carburetor is either one size too large or not properly adjusted for slow speed or starting the motor, probably the former. If the bore of the cylinder is not over $4\frac{1}{2}$ inches, a one inch carburetor should be ample. The Schebler Model L will give you better results than either D or E.

630

Timing the Valves.

From George M. Thomas, Jr., Kentucky.—I have a type "A" Maxwell runabout which has been giving me some trouble about overheating, and I wish you would please give me your opinion as to the cause and suggest a remedy. I have at all times kept the motor in good condition, free from carbon and valves ground, in. It is equipped with adjustable valve tappets which I keep adjusted as close as possible to secure quiet running and that the valves may open and close at the proper time. I have recently tried flushing out the water system with a strong solution of sal soda and have put on new water hose, but the overheating still continues. I had a new crankshaft bearing fitted a short time ago, and the repairman encountered considerable difficulty in replacing the flywheel. He finally heated the wheel in order as he said to make it go on easier. The result was that it was broken and it became necessary to get a new one from the factory. The new one had no timing marks on it, and I have thought that possibly I have the timing wrong. I have timed the exhaust valve to open at about ten degrees past center on the inlet stroke as near as I can get it. This method is common practice, but I thought possibly this particular machine may be an exception to the rule. The motor runs as quietly and develops as much power as when new, except that when run an hour or so on a hot day the engine heats up so that the water boils briskly with the result that the car becomes harsh running and inclined to knock. I have written the Maxwell Briscoe Co. three times about this trouble, but they have never given me any reply. Any information that you may be able to give me about this matter will be greatly appreciated.

Reply.—The article on cams in this issue may help you in timing your valves. We are a little uncertain as to what you mean when you say that you "have timed the exhaust valve to open at about ten degrees past center on the inlet stroke." Forty degrees before the lower center would be better for opening and five degrees before the upper center for closing the exhaust, the inlet to open ten degrees before the center or fifteen degrees after the exhaust closes. If your exhaust valve opens late you will consume more gasoline and developing so much additional heat would naturally boil the water.

631

A Kick in One Cylinder.

From Burson & Fowler, California.—In looking over your latest number we notice something that makes us wonder. Number 588, page 53, states that a knock or pound under the footboard of a Maxwell car may be caused by a loose flywheel. Please give us a reason for this when the flywheel is on the front end of the motor.

On a Chalmers 30, with ignition perfect, three cyl-

inders will operate perfectly on either battery or magneto. Cylinder No. 2 refuses to fire regularly, and when it does fire it causes a kick as though the spark occurred about half way on the compression stroke. We are positive that the spark occurs at the proper time as the battery and magneto are entirely separate. In cranking it kicks back very hard and also pops back in the carburetor when cylinder Number 2 fires. Why should this be so, as it has puzzled all of our machinists. Any information you can give will be greatly appreciated.

Reply.—The knock due to a loose flywheel will sound the entire length of the crankshaft, and the crankshaft rotates with a jerky motion while the flywheel rotates in a much more even manner. This jerky motion gives an uneven connection to the transmission shaft and a pound. Your timer may be imperfect, the segments not being accurately spaced. This would make it kick back hard, but as it pops back through the carburetor this can only occur with the inlet valve in either this or some other cylinder off its seat, a short circuit in the secondary wiring or timer causing ignition in two cylinders at the same time. Remove all four plugs and see if some other one does not spark at the same time as number two.

632 **A Defective Exhaust Valve.**

F. W. Boots, M. D., Hanover, Illinois.—I have a Warren-Detroit 4 cylinder 4 inch bore with $4\frac{1}{2}$ inch stroke motor, 1910 touring car. When running the motor with no load with the relief cocks open, the first cylinder fails to give any audible or palpable explosion, either on the magneto or batteries. But if I hold down three of the vibrators on the coils, that cylinder will carry the motor, though not as well as any one of the three others. So it does explode, though the finger held over the relief cock cannot feel it. The plugs are O. K., the compression is good, the valves were cleaned and ground, the intake pipe and manifold were explored for any obstruction, the ignition is perfect, so what is it? It does pretty well when on the road, though the motor is not as steady as it should be if all four had equal explosive force. I would like to remedy this if possible.

Reply.—Symptoms as described would indicate a broken or weak exhaust valve spring in the first cylinder, or the valve stem may stick slightly in the guide. It does not explode apparently when the other three cylinders are firing regularly with throttle partly closed, for the reason that burned gas is taken in through the exhaust valve to impoverish the otherwise explosive mixture. When the three vibrators are held down the gas is pumped into the exhaust manifold by the three cylinders and enters the first cylinder through the exhaust valve. A weak or broken exhaust valve spring would materially lessen the power in that cylinder.

633 **A Flanders 20 Puzzle.**

From A. W. Mueller, Iowa.—I have a Flanders 20 that is a puzzle. At times it will run like a clock. Then again I cannot start it, and would like your much appreciated advice by return mail. I can take it and run it for 30 miles without any trouble; then I stop and take care of my business and when I try to start again find it impossible. I have a Splitdorf magneto and coil and cannot understand the trouble unless it is a broken wire that disconnects and connects itself. My batteries test O.K., and the spark plugs do satisfactory work, but it takes a spell and I cannot get it started. Have you ever had anyone write you about this sort of trouble? It is certainly a

puzzle and disgusts me very much. Would a Schebler carburetor fit on a Flanders car?

Reply.—It is our opinion that your carburetor is either faulty or improperly adjusted for slow speed so that it gets an excess of gasoline just before it stops. To disprove this, priming with gasoline should give you some explosions after two or three revolutions of the starting crank. If no explosions it shows probably too much gasoline. We do not believe there is any wire trouble such as you fear. Be sure that your distributor is clean and that the sparks show at each plug lying flat on top of the cylinder in proper order, and not in two plugs at the same time. We think this is the first complaint of this nature. A Schebler Model L carburetor could be fitted.

634 **Singular Queries.**

From W. N. Hedback, Cumberland, Wisconsin.—1—Aside from good workmanship, what mechanically makes one motor quieter than another? 2—Why is the Ford T a quieter motor than the Flanders? 3—Why does the Ford T carbonize in the cylinders sooner than some other well-known automobiles? 4—If a casing blows out, is vulcanized and this blows out larger and finally splits open four or five inches under the outside tire sleeve which was put on, how can this case be made strong and useful again? Repair men here seem to give up the job. 5—About two weeks ago, after washing a Ford T which ran perfectly beforehand, we had difficulty in starting engine and after getting it started, it has run poorly on the first cylinder ever since. Advancing the throttle makes it miss on this same cylinder for a short distance, when it will again run on all four. It is not in the coil nor plug nor connection between. Can you suggest a remedy to cure this peculiar miss?

Reply.—1—Better designed valve actuating mechanism. 2—You can draw your own inference from our reply to No. 1 query, if you find that the Model T Ford is really quieter than the Flanders. 3—We do not know that it does. Carbon deposits indicate too much oil, imperfect or improper lubricating systems. No oil is suitable for every make and type of automobile motor. 4—We give it up, and compliment the repairmen on their sagacity. 5—Probably valve stems are sticking slightly in the missing cylinder, or rather the cylinder that is missing explosions. We usually advance the spark and open (not advance) the throttle.

635 **Trouble With His Overland.**

F. D. Bilbo, Indiana.—I am driving a four cylinder Model 30 Overland car, equipped with a Remy coil and magneto, a Schebler carburetor, model E, $1\frac{1}{4}$ in. This motor runs very nicely idle, but when I put her in high she does not seem to pick up her speed as she should and quite often she will die if I insist on a very hard pull before she warms up. If I am trying to make a hard pull on high gear the motor of course slows down. With throttle wide open she will miss fire in one cylinder continually, consequently killing the power. After ascending the grade on low gear, I am unable to get her into high gear without closing the throttle, allowing all cylinders to get to working good again. I can work her up to speed again by giving her a little throttle at a time. The motor will run along, firing all cylinders nicely at 15, 18 or 20 miles per hour with the throttle opened just four or five notches. If I give all the throttle on level road she will run up to 35 or 40 miles per hour and not miss fire, but let me come to a hill and try ascending with a wide open throttle, if motor has reduced her speed at all she loses one cylinder. You

understand the motor never misses fire on a wide open throttle if she is gaining speed all the time, but the moment she begins to lose her speed she also misses fire. I have tried almost all adjustments to the needle valve and I find she runs best at about one turn open of needle valve. I have tried most all positions of air valve. If I tighten the tension of the air valve spring it seems to kill the power more than ever. If I loosen the tension of the spring she is very hard to start and seems to miss fire more or less at irregular times. I have ground in the valves and put in new spark plugs and new piston rings. Have good compression. Some little thing is out of tune that I have overlooked. It may be the valves are out of time or the spark is too early.

Reply.—The Model L Schebler carburetor is much better adapted for automobile motors than the Models D or E. It was to remedy just such troubles as you are experiencing that the Model L was developed.

In adjusting the D or E it is always best to screw the adjusting screw down hard and regulate the gasoline valve to that position with the engine running as slowly as needed. Then as the throttle is opened the tension on the automatic air valve should be lessened. For slow speed regulate by needle valve only. For high speed leave the needle valve severely alone and regulate by the automatic air valve.

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A Muffler Trouble.

From C. W. Ferree, Pennsylvania.—I have a Maxwell runabout, and the thing is causing me some trouble. I had it to the repair shop the other day. They told me that the muffler needed cleaning out. They told me how to do it, and sent me home. I followed instructions but failed to accomplish it. I had every nut loose, could revolve it on the pipe, but it would not come off. Now then your advice is what I am after.

A question or two more: I will soon require a new muffler for my machine. I have in mind the Kingston or the Yankee, and the Maxwell people think this is the best. Your opinion along this line will be appreciated.

One more: I have a broken commutator spring. A small piece broke off the one end, I fixed it on again minus the piece. Could that spring be too tight, and cause trouble along the line of running the engine?

Reply.—Take the muffler to some reliable repair shop. Kingston, Yankee and Maxwell mufflers are all used extensively and we know quite satisfactorily. Shake three coins in your hat marking one Kingston, another Yankee and the third Maxwell. Then select one and make your choice accordingly. Much safer to have all springs alike than one with so much tension as to be likely to cause excessive wear.

The Unit Spark System.

From L. T. Rhoades, New York.—Under your Trouble Department in the July issue, Inquiry 580, your answer to C. M. A. Sornesen, I beg to take exception to the explanation regarding the Unit Spark System explained. You say this system of ignition doesn't employ batteries of any sort so far as you are able to learn, and the sole object of the system is to make one non-vibrating coil serve for any number of cylinders. You also are in error about the Master vibrator ever being used with the system in question. Briefly this system consists of a non-vibrating coil or a transformer, a very ingenious circuit breaking mechanism, which is intended to take the place of the ordinary timer, and high tension distributor which forms

a cover for the circuit actuating mechanism. This constitutes the entire system. No magneto of any description is necessary, as one set of 6 dry cells will furnish ignition for a very long period. The one single spark is furnished for each ignition, and has the remarkable advantage that the engine can't come to rest with the circuit closed. Neither can the spark be produced should the engine revolve in the reverse direction.

As before outlined, no vibrating coils, Master vibrators or magnetos are used with single spark systems such as the Atwater-Kent or Rhoades Unit Spark System, in fact, it is the ambition of the inventors of each of these systems to dispense with the above named electrical devices.

I trust that this will place your reader in possession of the correct explanation.

[Note by the Editor.—The contact maker in the Atwater-Kent system is in reality the vibrator, although it makes but a single vibration, rather than several as in the usual type of high tension ignition systems. We did not intend to mislead our readers and are obliged for this correction.]

Licenses in Sight.

From Frank M. Brennan, Massachusetts.—I have been a chauffeur in the State of Massachusetts for the past few years. I think that any State that does not require the chauffeur to wear his badge in plain sight when operating a car on the public highway is practising a bad policy. The only way the State police will know if such chauffeurs are licensed is by waiting until he has an accident. I think it would be a good policy for every State to make every man or woman driving a motor car take an examination to see if they are fit to drive cars on the public highways. I would also like to see inspectors in each county to see that the automobile laws are lived up to. This would do away with a lot of accidents and would do away with men driving cars without licenses. I think every man driving a car should know his business.

[Note by the Editor.—Although we fully approve of the last sentence in the foregoing, more accidents are due to carelessness than to lack of knowledge as to the mechanism of the car or how to run it. A driver who is careful, discreet, who does not attempt to operate a car when under the influence of liquor, and who has a due regard for the rights of other users of the highways, seldom has an accident, even though he may not be a thorough mechanic or engineer. Not but what a man should be a thorough mechanic and an accomplished engineer to properly care for and run a car, but this is not any business of the State or government, but a matter of private concern. The public welfare demands that the highways and streets should be safe for all, but it does not demand that cars should be run so as to give the best service or that they should have the best care.]

For Buick Model 10 Cars.

From Charles J. Root, New York.—I am a very careful reader of the "Trouble Department" and extremely interested in all that pertains to a Buick Model 10, and through your kindness in furnishing me with the address of some who have had trouble similar to mine, have corresponded with owners of these cars. Noticing the advertisement of The Best Ignition Equipment Company of their Plug on page 37 of your issue April, 1911, I sent for a set of them, their claim being that they were particularly adapted to the Buick cars. I have tried these plugs out most

thoroughly and the unpleasant "jerk" has disappeared and I sincerely wish that owners of Buick 10 could know what a difference the use of these plugs has made in the running of my car and should you have reports of trouble with these cars I think that you would confer a great favor by suggesting that a trial be made of these plugs.

The Slipping Rambler Clutch.

From I. M. Reed, Iowa.—In reading the June number I see No. 567 is an inquiry from L. A. Maxwell of Michigan, in regard to slipping clutch on a Rambler car. I will give you a remedy which never fails on a Rambler car for a slipping clutch. Put some Fuller's earth in an insect powder can and blow some on the inside of the fly wheel where clutch engages and no more trouble will be encountered for some time. When the clutch slips, repeat it, and occasionally wipe out all grease, and oil on the inside of the fly wheel.

For the Maxwell Runabout Engine.

From R. Setterblade, Illinois.—In answer to No. 588, from Mr. Oscar Rinker, regarding his Maxwell runabout, I would suggest that he examine the bolts that go through the frame and are tapped into the cylinder heads. These bolts have a habit of coming loose after the car has been in use for some time and let the compression escape and also produce a knock as the motor is not held very rigid then.

A New \$350 Runabout.

The United States Motor Company has produced a guaranteed efficient automobile to sell for \$350. The car is named the Liberty-Brush, and in some respects it resembles the popular Brush runabout. It is said to be



The Liberty-Brush Runabout.

capable of every service which can be expected of a runabout and is built with a power plant that will travel 35,000 miles.

The Liberty-Brush is expected to find its greatest use among salesmen, solicitors, collectors, R. F. D. carriers, physicians, contractors and dozens of other lines of business; in fact everyone who uses a horse and buggy can get cheaper, quicker and greater service from this runabout.

The Liberty-Brush is built in the Detroit factories of the United States Motor Company and will be marketed through the vast selling organization which the company has built up. The design of the car is based on the wis-

dom acquired from many years' experience in building utility runabouts. It has ample room for two passengers and baggage, the utmost ease of control and a range of speed equal to every demand of pleasure or utility.

Long and Short Stroke.

From Justus B. Entz of the Society of Automobile Engineers, New York.—In considering the relation of bore to stroke in an automobile gas engine we may assume that at 1,000 r.p.m. the power obtained will be proportional to the piston displacement, and that a $4\frac{1}{2} \times 4\frac{1}{2}$ and a $4 \times 5\frac{3}{4}$ will give equal power. If each engine is designed for the same percentage of compression space, and has valves proportional in size to the bore, we find that the shorter stroke engine has a total pressure on its piston head of $5\frac{3}{4}$ divided by $4\frac{1}{2}$, or 26 per cent. more than the longer stroke engine, and that as the crankshaft and connecting-rod bearings turn but once in their boxes per revolution, whether the stroke be long or short, that the loss in them is increased.

The side pressure of the piston on the cylinder walls is also greater in the same proportion, but as the piston speed is correspondingly less, this loss will be about the same in each. But the result is a higher mechanical efficiency for the long stroke. The piston in the long stroke is lighter, being less in head and wall, but the speed being higher, the balance of the two engines at the same revolutions per minute will probably not differ much.

The wall area of the compression space is less in the long stroke, and its thermal efficiency is higher therefore, as well as its mechanical efficiency. The torque of the long stroke is higher at low speeds, due to its higher thermal efficiency which is lowest at low speeds.

At high speeds, however, as the same volume must be drawn through smaller valves, the long stroke will have a less volumetric efficiency, if the valves are small enough to be the limiting factor, and therefore will lose power at high speeds. But in practice even in engines of 40 per cent. longer stroke than bore, the carburetor generally determines the volumetric efficiency rather than the valves.

It is, of course, a question as to how much stroke can be increased as compared with the bore and give better results, but I believe that engines with a stroke relation to bore of from 1.4 to 1.5 are lighter, more efficient and more flexible than shorter stroke engines.

Care of Chains.

Nothing but the bearings should be oiled in a chain, and the least oil that be put upon even these the better. Keep all grease or oil from the outside of the chain by giving it a thorough wiping after putting a little oil on the pins and rollers. When needing oil the chains should be removed and allowed to remain in kerosene for a few hours, or overnight, and thoroughly freed from all dirt; then take grease and mix into it a small amount of flake graphite. Over a flame (a blow lamp will do) turn the mixture into a liquid and steep the chain in it for a few minutes, moving it to and fro so that the grease has a chance of finding its way to the pins.

Hang the chain up on a nail over the pail in which the grease has been heated and it will drain off. When the mixture has cooled off whatever remains on the chain should be scraped off and the chain is ready for use. Graphite will greatly quiet the chain.

Replacing Bearing Balls.

From the Hess-Bright-Manufacturing Co., Pennsylvania.—In your issue of July, 1911, on page 44, we notice an article under the heading "An Ominous Noise." In that article you advocate the use of a new ball in a bearing in place of a broken one, but you say, "But unless the new ball is a shade too large, it will also certainly cause trouble."

This communication is addressed to you with a suggestion that you make a correction of an advice that is altogether likely to prove decidedly disastrous. The insertion of a ball, in a ball bearing, which is larger than its mates, even though it should be larger by only a few ten-thousandths of an inch, is absolutely sure to cause that ball to take the entire load once in each revolution, instead of allowing the load to be distributed over a number of balls.

The average ball bearing is so designed that long life will attend its use when all balls are of uniform size, so that load will be distributed over a number of balls. The result then of the large ball will be not only that that ball itself receives an overload and is likely to be damaged, but that it transmits that overload to both races and so results in damage to the races as well.

As a matter of fact, the use of a ball which is smaller than its neighbors is far less serious in a bearing than the use of a large ball. The use of a small ball simply makes that ball act as a spacer and the load will be carried by at least two of its immediate neighbors, resulting in a halving of the load on each.

Unless the party making a repair of a ball bearing, or inserting new balls is highly skilled in the use of a micrometer reading to about one ten-thousandths, it is necessary to have the repair attended to by someone who is so skilled. It will not do to buy balls from an ordinary dealer on that dealer's statement that the balls are all alike. Balls are not made all of one absolute size to a ten-thousandth of an inch, but the ball bearing manufacturer who turns out a good product is careful in making a selection from balls that are nominally of one size, to make sure that those that he puts into a bearing are actually of one size to within this limit of one ten-thousandth inch.

No criticism on the ordinary dealer in balls is intended by the above, since it is not to be expected that such dealer has the necessary skill to make a selection among balls by measuring them all to within one ten-thousandth part of an inch, nor is it possible for a dealer to carry a stock of balls such that he could carry regularly quantities selected to within one ten-thousandth part of an inch.

Another caution to observe in repairing a ball bearing is that new balls must not be mixed with old ones. If for any reason a single ball is to be replaced it will be far better to replace the entire series of balls. That is the only thing that will ensure the entire set in the bearing being uniform to within the necessary one ten-thousandth part of an inch.

Pounding and Losing Power.

From N. R. Saxton, New York.—I own a model AA Maxwell and saw that Oscar Rinker of Illinois is in trouble with his. I do not think your answer to his trouble was right. I think the pound under the foot-board comes from another source and that he will find the nut that holds the three point suspension of his engine loose. I did on mine.

Now, about losing his power. If he will set his magneto two cogs or more ahead, all it will stand, and not go backward, his power will be all right. That

is what I did after I had tried the carburetor and compression and everything else I could think of. Now it runs all right.

For Acetylene Lights.

From G. H. Adams, Kansas.—I see an inquiry from E. R. H., Vermont, in regard to the care of gas lamps. Will state my experience with acetylene lights. When I first got my car I would turn off the water at the tank and let the lights burn, but had a great deal of trouble getting a good light afterwards. I found by disconnecting the hose from the lamps and blowing through the hose before lighting again I had no more trouble. The steam in the gas condenses and stops up the hose.

Pneumatic and Solid Tires.

The fact is, few car owners or drivers fully appreciate the advantages of light pneumatic tires in their relation to ease of propulsion and riding. The Michelin Tire Company has been making some interesting experiments to learn the comparative merits of pneumatic and solid tires. Out of fifty experiments made, results are quoted in the case of eight, two of these results being reproduced in Figs. 1 and 2.

A wheel loaded with a weight of half a ton, fitted first with a solid rubber tire 2.46 inches thick and then

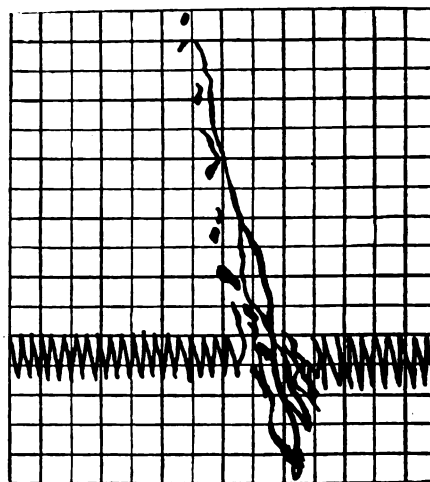


Fig. 1—Record of Vibrations of Solid Tires

with a pneumatic tire, was set revolving at a speed of 16 miles an hour on a flywheel. The very broad rim of this flywheel was arranged to accommodate various objects which would give it an uneven surface. The displacements of the hub of the wheel were registered by a pen attachment, which traced the exact height of each rise and fall on a cylinder revolving at uniform speed. In this way the flywheel exactly represented the uneven surface of a road, while the wheel played the part of a car wheel. A first examination of the curves shows that in each instance the pen has traced the constant vibrations, which in the case of the solid tire measure from 0.23 to 0.27 inch, even when no object has been placed on the flywheel, while they register only 0.02 inch with the air-filled tire. These tracings came entirely from the flywheel and give some idea of the work of solid as compared with air-filled tires.

Over a long half oval obstacle, 1.17 inches high, the solid tire raises the wheel 2.30 inches.

Over a long half oval obstacle 1.17 inches high, the pneumatic tire raises the wheel 0.44 inch.

These diagrams, it is added, indicate that the pneu-

matic tire absorbs the obstacle, the height to which the hub is raised being less than the height of the obstacle itself, while the solid rubber tire does not prevent the wheel from rising higher than the obstacle.

The natural advantages thus connected with pneumatic tires are accentuated by their use in the form of

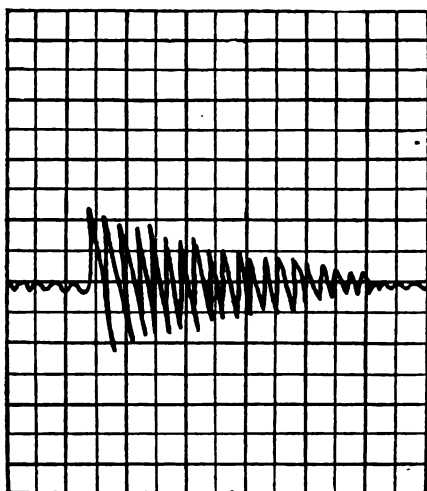


Fig 2—Record of Vibrations of Pneumatic Tires.

“twin tires,” when two or sometimes three pneumatic tires are placed side by side on the same wheel; the pneumatic suspension thus afforded ensuring speed with comfort and increasing the weight-carrying power.

Weights That Tires Can Carry.

If motorists would take care of their tires, the tire expense would take care of itself, but the majority of owners know so little about tires that they are responsible for the second-hand tire man, says W. H. Stewart. Overweight on a casing will quite frequently break the fabric, and the result will be a “blowout,” and by the time this has happened the casing will be so badly damaged that it will be beyond repair. It is quite often the case that tires with which a car is originally fitted do not give a sufficient allowance for additional equipment or extra passengers, but few owners or chauffeurs know how much weight tires can stand.

Mr. Stewart says that he has seen eight passengers and one trunk in an automobile going at a high rate of speed, yet the owner of that car wonders why his tire bills are so high.

The following are a few of the weights which tires of different sizes are supposed to carry, of course allowance being made for the usual number of passengers:

Weight.		Weight.	
Rear.	Front.	Rear.	Front.
28x3.....	350 425	32x4.....	650 800
32x3.....	375 450	42x4.....	900 1,050
30x4.....	625 750	34x5.....	950 1,200
30x3.....	375 450	43x5.....	1,400 1,550
31x4.....	635 775		

A great many motorists think they know whether their tires are sufficiently inflated by observing the degree to which they flatten at the point of contact with the roadbed, but this is one of the surest ways of a tire finding its way into the second-hand store.

The services for chauffeurs for twelve months in New York cost \$27,300,000.

STEAM CAR DEPARTMENT

This department is intended for owners, users and others interested in the steam car.

Those who have trouble with their steam cars are asked to give clear and full particulars, and their queries will be answered as correctly as possible by an expert. It will be considered a favor if our readers will contribute to this department, giving such information as may be useful to others using the steam car.

Neglect of the Boilers.

From Edwin L. Ide, Michigan.—As a steam engineer, and owner of a Stanley Steamer, I am frequently called upon to make some slight repair, or to advise in the care and management of them. In nearly every case of trouble I find that it is due to neglect of the very simple rules, which if followed carefully, will give one renewed confidence in his car, and in himself, to meet and overcome any difficulty which may arise.

A number of steam car owners have the same trouble with their boilers that water cooled gasoline car owners have with their water jackets and radiators, viz: Scale or lime deposits from using hard water. It doesn't require a very heavy deposit of this scale to seriously impair the efficiency of either type of car. The remedy for this is to use only soft water in your boiler from the beginning; and even then the boiler and connections should be blown out at the end of the run. When using soft water it is not necessary to blow all of the water out of the boiler, but just enough to get the sediment out of the pipes and connections. If the boiler is already scaled badly from using hard water, a good boiler compound can be obtained from any engineer or if that is not obtainable use a strong solution of sal soda for a few days, blowing out often until the scale is all dissolved. I would advise not to run the car during this operation, just keep it boiling hot until clean.

Be sure and keep the water inlet pipe open, the pump well packed and there will be no further trouble from the boiler department. Next comes the burner: The greatest cause of trouble here, in fact the only trouble I have found is clogged vaporizer tubes. If care is taken at the end of each trip to blow these tubes out thoroughly, this trouble will be reduced to the minimum.

In closing, perhaps my own method of procedure may be of interest and profit. At the end of the trip, whether it has been five, fifty or a hundred miles, I first shut off the pilot and main burners. Next I open the boiler, blow off, and let it blow ten or fifteen seconds. Next I open the main try cock, and, while it is blowing, close the steam valve at top, so as to thoroughly blow out the bottom connection to the boiler. Next I open the try cock on the water regulator to free that connection from any sediment which may have lodged there. By the time this is done the pilot will have burned out or be low enough so that it can be easily blown out, and I then proceed to blow out the vaporizer tubes.

First I take out the bottom, clean out the screw from the pilot tube, open the valve and let it blow until the gasoline comes. Next I take the main burner tubes one at a time and blow them in the same manner. Then I take out the upper screws and run a small soft wire through the nozzles of all three, wipe off the pilot needle valve and replace everything as before. The result is a clean pilot and burner for the next trip. I always make sure that my pilot is burning

properly before starting the main fire, when firing up. A few minutes attention to these little things will add pleasure to your trip, be it long or short and make your steam car a monument of strength and endurance, and a joy forever.

The Flash Generator.

From J. Harris Wight, Massachusetts.—To help Stanford E. Frazell out, I want to say I have run a 1906 White flash generator or boiler for three seasons and ran it hard too, and I do not know how much it had seen before I bought the car. My generator today as far as I can see is just as good as new in every respect. I had it out of car this spring and cleaned up nicely. It has not once caused me any trouble in any way and steams fine as I get five times more speed, and for a hill I can make rapid speed and hold it easy. The life of a flash generator depends on the owner. If he lets the car run hot it soon burns the lower coils and then they split out. I have known them to plug up, but I can't see how they do it unless the checks get clogged from letting the old oil on top of the water tank get into them, but if the tank is kept flushed off, it can't happen. In winter when my car is up, I fire it up once in two weeks and let it run for about 15 minutes; this keeps all parts O. K. and does not let them rust. I carry 650 pounds on generator and at times it runs to 800 but travelling it runs on 650. After three seasons of burning nothing but kerosene, I would not burn gasoline in the main burner if it were given to me. I get more mileage and 50% more steam and make the car very speedy on road and hills. On my kerosene feed nozzle I use the 57 4-hole spray while the White Company advise the 3-hole, but after trying both for miles, I find the 4-hole nozzle steams faster, gives better combustion, and is in several ways quicker.

The Pilot Trouble.

From J. Harris Wight, Massachusetts.—In the case of F. S. H. of Georgia, his pilot trouble came from the small hole in the feeding needle of his pilot. No doubt this hole has come so large it let too much fuel pass it at a time. This will cause very high flame and run his steam up, and it will take a long time to get the pilot hot enough to vaporize the fuel. If the pilot hole is small as it should be he can flush the starting cup and as soon as it is most out he can open the main needle and it will burn immediately nice and blue. It takes about one to two minutes to have the pilot going perfectly; the pilot should have a blue flame passing not over one inch above the vaporizer; if less it is just as well. This will in two minutes heat his vaporizer so hot that the fuel will be vaporized perfectly as it enters the burner. If he gets a yellow flame it will not heat good, nor will it vaporize good, but the burner will whistle badly and even smoke. I use kerosene only in my main burner and gasoline in pilot. I get over ten miles to the gallon of kerosene and from 125 to 150 miles out of the tank of gallons of water.

Solid Tires and Superheated Steam.

From J. Harris Wight, Massachusetts.—I note a party asks about solid tires. I experimented with them and found them to be very unsatisfactory. They drag on hills; are hard in sand, ride hard, make the car sway on road in rear, and it took 25% more power to run car.

If Mr. F. H. Rudd wants to know why an auto engine doesn't use as much water as his traction

engine, it is because it is made to use high superheated steam with a pressure of 500 up to 1200 and compound at that; that is, the steam is let into the high piston and then exhausts to the low piston which is much larger than the high, then into a condenser on front of the car and then water is pumped back to the tank. I get out of 17 gallons, from 125 to 150 miles. Have got on a test 162 miles on good roads. The engine is run about $\frac{1}{4}$ on expansion; that is, the valves are cut off and the piston travels the rest of the stroke by the expansion of the superheated steam. This engine will not run on wet steam. It would simply pound and make the car shake so bad, it would not travel good. This engine is made to wet steam and no doubt he wastes more water than he uses, while we save every drop of it.

W. E., of Iowa, can get any part he wants for his Locomobile of J. L. Lucas & Son, Bridgeport, Connecticut; they carry a large line of all models of the steam loco car.

Slow Piston Speed Wins.

In the recent standard car race in England the competing cars showed the following averages:

The winning Star, an average of 56.247 miles per hour. Engine, 1,780 r.p.m.; piston speed, 23.4 feet per second, or 1,404 feet per minute.

The second car, the Singer, at average speed; Engine, 2,090 r.p.m.; piston speed, 28.6 feet per second, or 1,716 feet per minute.

The fourth car, the Gladiator, at average speed: Engine, 2,490 r.p.m.; piston speed, 29.9 feet per second, or 1,794 feet per minute.

The fifth car, the Armstrong-Whitworth, at average speed; Engine, 1,793 r.p.m.; piston speed, 26.7 feet per second, or 1,602 feet per minute.

The winner's r.p.m. and piston speed were considerably lower than those of the second car, this being accounted for by the fact that the winner's gear was higher and his stroke shorter. Probably the highest engine speed in the race was made by the fourth car, the Gladiator, as that had a comparatively low gear, so that even with its shorter stroke it made the highest piston speed as well as the highest r.p.m. of the placed cars.

All these engines exceeded the speeds given, as the figures are based upon the average speed throughout the race, and it naturally follows that the maximum speeds attained were very considerably higher.

Why It is Unpopular.

From Actual Experiences, New York.—As one who has driven a steam car for pleasure for many thousands of miles in various parts of the country, I should like to offer a few remarks on this subject. It seems to me that some of the reasons why the steam car is not as popular to-day as it might be are rather financial than mechanical. If there had been one fraction of the capital which has been used in the production of cars propelled by internal combustion engines put to making and selling of steam cars, they would hold a very different position from what they do now, and consequently every town of importance would have its steam car expert, and the owner of a steam car, when on tour, would not feel, as he often does now, that should anything go amiss with his car there is very little hope of getting any intelligent help without sending to the maker.

There is no doubt that the frequent stopping for water was a very real objection, especially when on

tour, as you then often stopped more frequently than was really necessary, being afraid to run too low in case you could not get water when you wanted it; but this is of the past—the modern steam car will go as far on one filling as most people care to drive without a stop.

The time taken to raise steam, I must admit, sometimes makes you wish you had a gasoline car, on the understanding, of course, that it belongs to the class which always start at the first turn of the handle; but still, having once got steam, you have your compensation in the quiet way the car glides long, and after a stop you move away in the same noiseless way. I must say that wherever I have been this point of the steam car is readily admitted and appreciated, even by the greatest opponents of steam.

Another point about a steam car is the ease with which it is driven, only one little lever on the steering column to start, stop, increase or decrease speed. What a boon this is when you get in narrow roads with sharp corners, and up and down hill as well. You have no need to take risks by going fast round corners to save the trouble of changing speeds, because there is no change-speed gear. You just close the throttle a little, and the car slows down; open it, and it speeds up once more. The driver who is used to a gasoline car only wants to have a turn at driving a steamer to be thoroughly impressed with the simplicity of the operation.

I am convinced that most of the prejudice against this class of car is due to people's ignorance of it, and what knowledge they do possess on the subject can be usually traced to the experience some acquaintance has had on a steam car some eight or ten years ago.

Automobiles in Nova Scotia.

From Charles D. Sherman, Connecticut.—It was a hot, sultry afternoon that I sailed from Boston on the steamer "Prince Arthur" for Yarmouth, Nova Scotia, in hopes of finding a cool place in which to spend the month of August, and I can say that I have not been disappointed. We had 340 passengers on our steamer when we left Boston and I noticed three automobiles on the upper deck. I am sure the readers of this magazine will be surprised when I inform them that over 75 automobiles are owned by residents of Yarmouth and that more than 500 cars are registered in the province of Nova Scotia. Automobiles owned by residents pay a registration fee of five dollars. The registration fee is perpetual and is not renewed each year as is the case in the States.

Some of the finest roads in the Province of Nova Scotia are to be found in Yarmouth County, which has more motorists than any other two counties in the province.

It is only of recent years that motoring in Nova Scotia has been at all possible, owing to a combination of circumstances which confronted one at the border, among which were customs restrictions, local exclusion laws, poor hotel accommodations, and unfavorable road conditions, but practically all of these have now been overcome. While it is true that the customs restrictions are still in force and one is obliged to give a bond, that presents practically no difficulty, for the reason that nearly all the well-known bonding companies have offices at the various ports of entry, and a person may secure a bond with practically no difficulty in less than twenty minutes.

The burdensome local regulations, which practically excluded automobiles from the best part of Nova Scotia, have been abolished. Formerly every county

had prohibited days, and unfortunately, no two counties selected the same days, but within the last two years these local regulations have been abolished.

While it is true that there are not many first-class hotels in Nova Scotia, considerable improvement has been made, and motorists may now tour all over Nova Scotia without meeting with what might be called very bad or undesirable hotels. The value of encouraging motorists has become apparent to hotel proprietors as well as others in this delightful province.

The good road movement has also taken hold of the people, and from Yarmouth to Moncton in New Brunswick the roads are as good as one would find in the State of Massachusetts or New Jersey, except possibly a section of the road from Wolfville around through Truro to Londonderry, but that is not a bad road, and may be classed as a good road during the months of July, August and September.

There are so many of the descendants of the United Empire loyalists settled in the provinces that the New Englander feels as though he had come over to visit relatives, while interspersed are the remnants of the Arcadians, whose expulsion left such a blot upon the British crown. Historic associations are a part of the land, and one can only pity the person who has not read Longfellow's beautiful poem and shed tears of pity with "Evangeline."

To Repair a Horn Bulb.

The following is a comparatively simple method of making a permanent repair of the usual form of a horn bulb, but the operator should be possessed of a vulcanizing apparatus.

Fig. 1 illustrates a very common form of split on the top of a bulb. The first process of repair is thor-

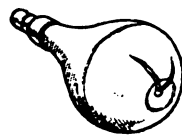


Fig. 1.



Fig. 2.



Fig. 3.

oughly to clean the rubber where it is split with benzine outside and inside if possible (the crack very often is large enough to enable the inside to be cleaned). The rubber inside should then be roughed with a rasp or wire scratch brush, and the edges of the split outside having been bevelled off with a pair of scissors and subsequently roughed with the rasp, in section the split will be as shown in Fig. 2. If the size of the split will allow, a piece of old inner tube should be inserted to cover the split, the rubber (which, of course, should not be perished) having previously been roughed and covered with vulcanizing solution. The inside of the bulb having also been treated with vulcanizing solution, it will be easier to insert and fix the rubber patch before the solution dries.

The split and bevelled portion should then be coated with the solution and allowed to dry for several hours if possible. Some lengths of vulcanising compound about a quarter of an inch wide should then be cut and softened by heat on the vulcaniser, and pressed into the V section split until the whole is level with the contour of the bulb. The bulb can then be pressed up in the form shown in section in Fig. 3. The doubled-in portion, behind the split as it were, should be filled as tightly as possible with rags, and the whole then covered with a piece of thin linen sprinkled with French chalk where it comes in contact with the un-vulcanised rubber. Care must be taken that no creases in the bulb are allowed to remain in contact with the vulcaniser, otherwise a permanent kink will occur.

Trade Directory Innovation.

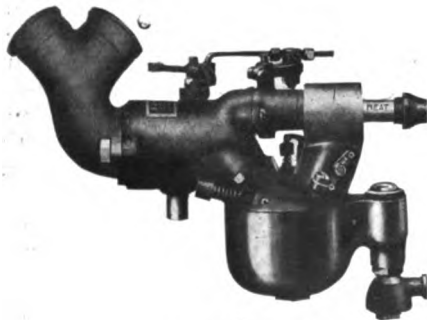
A Card Index Catalogue Directory of the Automobile and Allied Trades is being published by the Card Index Directories Company, 17 Madison avenue, New York City. The Directory is being revised and brought right up-to-date and is printed on cards 6x4 inches. About 300 guide card classifications are included, the whole being shipped in a



two drawer cabinet. A nominal charge of \$2 only is made for the complete outfit and the publishers emphasize the fact that the first cost is the only cost, the corrections and additions to the Directory being sent out periodically free of charge to all owners of the files. Altogether it forms a valuable addition to the office equipment of any garage, dealer or manufacturer. Interested readers should write for full particulars and mention this magazine.

The Buick Special Marvel Carburetor.

The Marvel Carburetor Company, whose product is already well known to our readers announce a new carburetor which they call "The Big Buick Special," for Models 16, 17, 19 and 21 Buick cars. This carburetor has a large heat jacket under automatic control. The increasing demand for Marvel carburetors for Buick cars has war-



Buick Special Carburetor.

ranted the manufacturers in producing this special model. It is all ready to slip on and very convenient for any of the Buick cars. This is only one of the special models manufactured by these people. Write for further particulars to the Marvel Carburetor Company, 2225 Alford street, Indianapolis, Ind., and mention this journal.

Will Remove to Yonkers.—A. R. Mosler & Company, manufacturers of the celebrated line of Spit Fire and Breech

Block spark plugs, have found it impossible to any longer carry on their business within the limited space afforded them at 163 West 29th street, New York City, and have announced that on or about December 1st, they will be located in their new factory, which is now under construction at 241st street, Wakefield Park, Yonkers, N. Y. This plant will be thoroughly equipped with

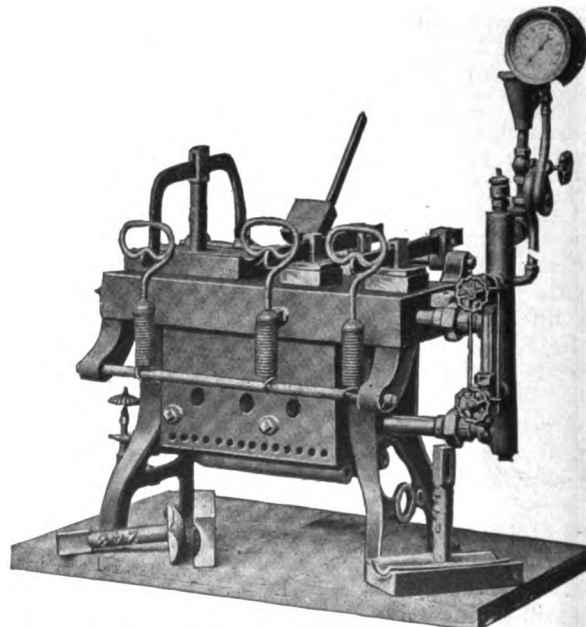
with burners for gas or gasoline as desired. The steam generator is complete with burners, steam gauge, safety valve, water gauge and filling funnel. In addition to three pressure bars for inner tube work, a set of three blocks with inner cores to cure small casing repairs is provided. The entire outfit is well finished, substantial and designed on practical lines. For prices and complete particulars readers should write to The Williams Foundry & Machine Company, Akron, Ohio, and mention this magazine.

"Best" Oil Proof Spark Plugs.—The special attention of our readers is directed to the half-page advertisement which appears in this issue on the page opposite our first reading page, setting forth the merits of the "Best" Oil Proof Spark Plugs. It is claimed these spark plugs will cure the "jerk" in your motor and this matter is also referred to by a correspondent this month in our "Trouble Department" who tells his experience with a Buick car and "Best" plug. Mr. Root's experience is interesting and it would pay our readers to look the matter up while reading this paper. Best plugs are being supplied to Buick owners in every State in the Union, Models 10 to 33, and Ford owners Models N, R, S, and T, with equally satisfactory results. Send for booklet "R," containing a lot of interesting spark plug information to the Best Ignition Equipment Company, 200 West 64th street, New York City, and mention this journal. Irvin Silverberg & Company, 335 Golden Gate avenue, San Francisco, are the Pacific Coast agents for this plug.

Tire Repair Equipment for Garages.

For the garage or repair station wishing to handle inner tube repairs and minor repairs to casings such as cuts, blisters and torn treads, the little plant

Multibestos Brake Band Lining.—This brake lining has long life and excellent friction qualities. It gives great efficiency and service and meets every requirement for a safe and satisfactory



Steam Tire Repair Equipment for Garages. Manufactured by the Williams Foundry and Machine Co., Akron, O.

shown herewith is a winner. It will cure any tube repair and the repairs to casings that do not require the services of an expert repairman. This equipment consists of an 8 inch x 20 inch Inner Tube Vulcanizer with three pressure bars, combined with an efficient steam generator which will be fitted

brake lining. It is manufactured by the Standard Woven Fabric Company, Worcester, Mass., to whom all inquiries should be addressed. In writing them mention this magazine.

Subscribe to the "Automobile Dealer and Repairer," \$1.00 Per Year.

"NATIONAL"

Steam Vulcanizers

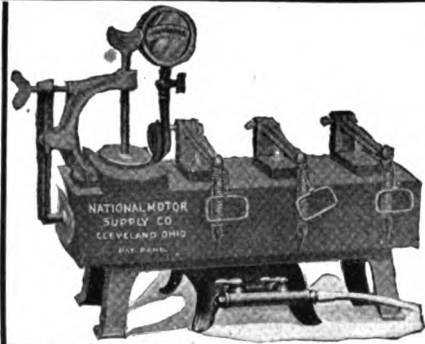
FREE TRIAL

"National" Portable Steam Vulcanizer for owners to repair their own tubes and casings, any time, anywhere, in a few minutes, at a few cents expense.

Don't take a chance of burning your tires with an electric or other DRY-HEATED Vulcanizer. Buy a "National" and be on the safe side. No electric current required. Generates its own steam. Total weight four pounds. Tuck it in your tool box when touring. Cuts your tire expense in half. No experience required. Beware of imitations. Get the original "National." 15,000 SATISFIED customers. Send us bank references, and we will ship you complete outfit with instructions. Test it for ten days free. Then send us \$12 or return the Vulcanizer. You do not see any other vulcanizer manufacturer making such an offer. Why? They know better. We have sold the "National" this way for two years. Must do the work? See for yourself by ordering one to-day.

NATIONAL GARAGE VULCANIZER

The one perfect vulcanizer for garage men—made by people who know how to make vulcanizers. The "National" will repair three tubes and two casing at once. Is heated by gas, gasoline, or attached to steam line. Weight 125 pounds. Any garage man can pay for this machine with a few days' profit. The simplest and most economical vulcanizer on the market. Will turn out as much work as any \$100 vulcanizer made.



Write for full description and dealer's discount. Why not do all that vulcanizing that you are letting the other man take from you and make \$20 to \$30 profit on a day? List Price, \$50.00, complete.

We manufacture other auto specialties.

WRITE FOR NEW 1912 CATALOG.

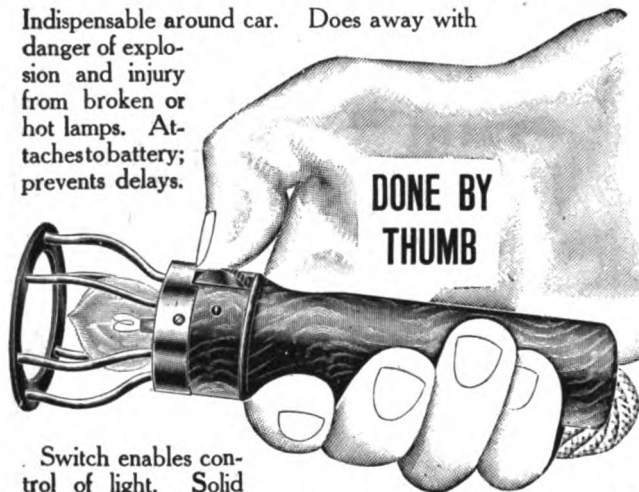
**THE NATIONAL
MOTOR SUPPLY CO.**
1915 Euclid Ave., CLEVELAND, O.

Manufactured by

**THE
NATIONAL
MOTOR SUPPLY Co.**
CLEVELAND OHIO U.S.A.

Troubles Are Quickly Located With THE THUMSWITCH TROUBLE FINDER

Indispensable around car. Does away with danger of explosion and injury from broken or hot lamps. Attaches to battery; prevents delays.



Switch enables control of light. Solid brass guard, handsome handle; takes any miniature lamp—2 to 6 volt. Complete with 10 ft. cord and battery terminals.

A quick, profitable seller for dealers, garages and supply houses. Sells on sight. Price, with 6 volt lamp, \$1.50; without lamp, \$1.25. Liberal discount to dealers.

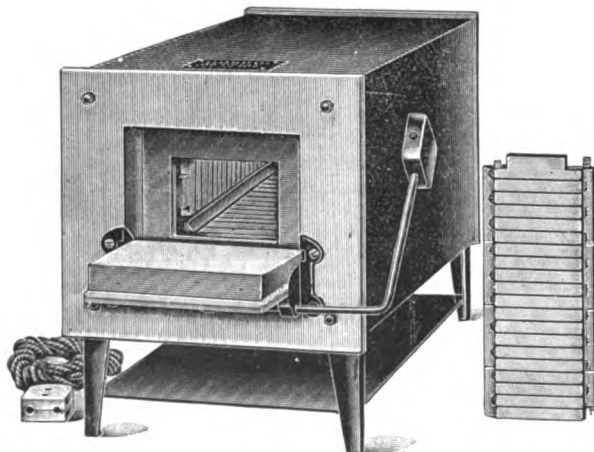
Write for catalog showing many garage and car money savers.

McGILL MFG. CO., 88 OAK STREET, VALPARAISO, IND.

Electric Furnace for Garages:

In all garages, especially those in which machine work is being done, a very essential piece of apparatus is a forge, blow-pipe or some other method of heating the various parts which may

System, manufactured by the Multiple Unit Electric Company, Liberty street, this city. We believe this device will be a boon to all garages because of its cleanliness, ease of control, portability, and last but by no means least, the com-



TYPE MU MUFFLE FURNACE

Manufactured by the Multiple Unit Electric Co., 136 Liberty Street, New York City.

be required for a job, and one of the greatest objections of the insurance people is the use of an open flame, owing to the close proximity of gasoline not only in the autos themselves, but also stored about the place.

We show in this issue an electric furnace, but other heating appliances of any size or character can be built to order on the same general principle, which is known as the Replacable Unit

System removing of the underwriter's objections, speaking now from the fire hazard standpoint.

Electricity as a source of heat production is by no means new; numberless attempts have been made to adapt it for industrial work and while it does give off the heat the use or device has up to the present time been greatly restricted owing to the rapid burning out of the heat-producing medium whatever it may

Not So Expensive.

That it costs no more to take a party of five to Coney Island from New York City in a comfortable automobile than it would cost for the same trip by elevated or trolley lines, was the declaration of H. Clifford Brokaw, in an address at the West Side Young Men's Christian Association. The automobile, Mr. Brokaw said, was not so expensive in its upkeep as most people think. "It's the owner's ignorance that makes his automobile an expensive luxury. As a concrete example of the inexpensiveness of using an automobile, I will show that it costs no more to take a party of five to Coney Island in your automobile than it would to go from Manhattan to Coney packed in crowded elevated trains.

"By elevated train it would cost \$1.50 return trip from a point in Manhattan to Coney Island, counting carfare to Brooklyn Bridge, and from there to the Island. At that you would probably stand most of the way, and on a very warm night, it is certain you would be jammed into a stuffy car. With the driver running an automobile intelligently, the same trip for five persons in the comfort of an up-to-date automobile would not be more than \$1.50. This includes wear on tires. I figure it: Wear on tires, 80 cents; 1 3/4 gallons of gasoline, 35 cents; lubricating oil, 15 cents, and toll over the Brooklyn Bridge, 20 cents.

"If you find your machine an expensive luxury there is something wrong," continued Mr. Brokaw. "Watch your exhaust pipes; if the exhaust is black, it means that you are feeding too much gasoline. If the mixture is correct, for every gallon of gasoline consumed there will be 8,580 gallons of air—air is cheap, and any more gasoline means less efficiency and greater cost. If the exhaust pipe, on the other hand, sends out clouds of rank-smelling blue-looking smoke, it means that you are feeding too much lubricating oil.

be. In the replacable unit system which we illustrate here, these difficulties have been entirely overcome by making the structure which gives off the heat in sections or units so that in case of a burn-out the consumer can easily repair it in less than ten minutes by simply removing the front cover as shown in one of the cuts and withdrawing the damaged unit or section and replacing by a new one; the damaged section being returned when convenient to the factory for re-wiring. Lack of space prevents us giving a more detailed description. The manufacturers, the Multiple Unit Electric Company of New York City, will be pleased to give full information and send circulars to those interested. In writing them, mention this magazine.

Michener's Chain Carbon Remover.—

This well-known article which has been advertised in our columns for a long time is manufactured by E. S. Michener of New Castle, Pa., and several of the leading manufacturers of automobiles are becoming interested in this device. The Fiat Company of Poughkeepsie, N. Y., after trying a half-dozen chains in their experimental department were so well pleased with it, that they have decided to put one in each of their tool kits and have now ordered large lots from the manufacturers for this purpose. Any of our readers who may be interested in a quick and thorough carbon remover should write for prices and further particulars to E. S. Michener, New Castle, Pa. In writing, kindly mention this publication.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

Goodyear Protection Patches Will Get the Car Home

A cut clear through the outer casing—20 miles from home. That predicament can be easily overcome. Always carry Goodyear Protection Patches—and tire worries are gone.



There is no longer any need to run home on a flat tire, after a blowout in your last spare casing, for that means a new tire next day.

Because that emergency may arise any time, always carry Goodyear Protection Patches.

An outside boot fits firmly over the casing and laces over the rim with a thong. This protects the tire. No dirt can work into the cut.

An inside patch fits snugly inside the casing. This prevents damage to the fabric and prevents pinching the tube.

This way a car can run many miles. Note how snugly the patches fit, so there is no danger of recurrence of this tire difficulty.

Goodyear Protection Patches possess wide popularity amongst automobile owners. There is a strong demand for them.

OTHER
GOOD YEAR
ACCESSORIES



Inside Tire Protectors, Rim Cut Patches, Self Cure Repair Outfits, Lever Handle Grips, Inner Tube Bags, Quick Repair Gum and other accessories.

Dealers, Repair Men, Garage Men find that Goodyear accessories are producers of bigger business than any other line. This is due to the absolute satisfaction given by every article and by our tremendous advertising campaigns which have made these accessories known to every driver of an automobile. Write today to

The Goodyear Tire & Rubber Company

Sprague Street, AKRON, OHIO

Branches and Agencies in 103 Principal Cities

If You Will Help Us To Sell FOUR FOX TYPEWRITERS

At Only \$50. Each WE WILL GIVE YOU ONE FREE

The world-famous Fox Typewriters, model No. 10—now being offered by us for the first time for FIFTY DOLLARS—are not second-hand, nor rebuilt, nor even shopworn, but are strictly new stock, fresh and bright, and direct from the stockroom of the Fox Typewriter Co., whose factory and general offices are located here in Grand Rapids, Mich.

Don't be fooled by misleading advertisements offering "PERFECT" typewriters at about the same price we are asking you for this new Fox stock, for after you have bought one of them you will find that the "perfect" does not mean "NEW," and you have been sent a second hand typewriter simply repaired or rebuilt by some typewriter syndicate.

The Fox Model No. 10 that we will send you for examination and trial—BEFORE ASKING YOU TO PAY US A SINGLE PENNY—is one of the highest grade typewriters ever built, and will give a lifetime of satisfactory service with probably the only expenditure for up-keep of an occasional typewriter ribbon. The frames are beautifully finished in a lustrous baked—on black enamel with green and gold stripes and with the famous Fox Head transfer trade-mark. A fine metal cover with oak base—which can be locked with small padlock if desired—furnished free with every Model No. 10.

Don't wait, but sign our trial order blank now—BEFORE YOU LAY THIS OFFER ASIDE—and mail to us, and the typewriter will be sent to you promptly by express for ten days' trial. After trial, if the typewriter is perfectly satisfactory you can send us five dollars as a first payment and five dollars monthly until fifty dollars has been paid. If you do not find the typewriter satisfactory, you have simply to put it back in the packing box in which you received it and return it to us—we will pay the return transportation charges. Simple and easy, isn't it—and perfectly safe, too.

Date.....19.....

MICHIGAN TYPEWRITER EXCHANGE,
6608-6618 River Front,
GRAND RAPIDS, MICHIGAN.

Dear Sirs:—Please send me one Fox Typewriter, Model No. 10, to be used as a sample and returned within ten days if not sold or purchased, as per your advertisement in the AUTOMOBILE DEALER AND REPAIRER.

NAME.....

ADDRESS.....

BUSINESS.....

More About Acetylene.

From Richard P. Elliott, Massachusetts.—The article of O. H. Hampton of Indiana in the July issue of your magazine, regarding the care and operation of acetylene gas generators for automobiles, is interesting and instructive. Mr. Hampton very clearly points out the inherent defects in the water-drip type of acetylene gas generators, such as overheating, steaming, and the consequent clogging of the piping connecting the generator to the lamps. Overheating is bound to occur when a small quantity of water is brought into contact with a relatively larger quantity of carbide.

Among other results produced by overheating is the disassociation of the gas, which in turn causes the tarry deposit in the generator and the piping and greatly impairs the quality of the gas, as well as the volume that can be produced from a given quantity of carbide.

Manufacturers of large acetylene generators for house and town lighting have discontinued the manufacture of the water-drip type of generators and are making the type which feeds small quantities of carbide to a relatively excessive quantity of water. This type of generator is known as the carbide-feed type. By feeding the carbide to the water, overheating is entirely eliminated and the gas as generated is delivered to the piping and burners cool, dry and free from dust and tarry products, and will produce a brilliant white flame of high candle power. Furthermore, one pound of carbide will give at least one-third (1-3) more in volume of pure gas than can be obtained from the water-drip generator. A good point in favor of the carbide-feed method of generating acetylene gas is that there is absolutely no after or over-generation and consequent loss of gas, for when the feeding mechanism is locked, generation ceases instantly, and when unlocked, generation commences instantly.

It may be interesting to your readers to know that the only type of acetylene generators that will receive the unqualified approval of the National Board of Fire Underwriters at the present time is that employing the carbide-feed method of generating the gas.

Exhaust Pipe Deposit.

In cleaning a muffler always examine the condition of the interior of the exhaust pipe, more especially at the end which is secured to the muffler, for very often at this end of the pipe a heavy deposit of burnt oil will be found which in some cases restricts the area of the pipe as much as fifteen or twenty per cent. This is especially the case with those engines which have a tendency to smoke at the exhaust. The burnt oil issuing from the engine is, of course, deposited within the whole length of the exhaust branch and pipe, but the interior of the former, and of the latter near the engine, is scavenged, one might say, by the subsequent clean exhaust issuing from the engine. The exhaust issues from the engine in the form of a flame, which burns away the deposit within the exhaust branch, but as the exhaust gases travel along the length of the pipe leading to the muffler they are naturally cooled and the flame does not extend within the whole length so that the burning effect is not present at the rear end of the pipe; consequently, any deposit which is formed remains and rapidly accumulates to restrict the passage within the pipe.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

A.
S.
B.

TIRE PROTECTOR

SPECIAL

Introductory Price

—TO—

Automobile Owners

If we have no agency in your territory handling the A. S. B. Tire Protectors, we will make a *Special Introductory Price* to the first man ordering a full set of four A. S. B. Treads.

We are going to make this Special Price in order to get a car equipped with our Treads. We want to prove to the car owners that the A. S. B. Tread is the only mechanically perfect Tread on the market. That is all we ask. Get the first car equipped with our Protectors. The Treads will do the talking then and will get the repeat orders.

The A. S. B. Tire Protector is the only Tread on the market that has a self-adjustable spring fastener. This attachment actually prevents excessive creeping. Guaranteed to not heat, chafe nor injure your tires by creeping. It is absolutely puncture proof, and non-creep as well as non-skid. It is air-cooled. A tire equipped with an A. S. B. Tire Protector runs cooler than without one.

With hot weather comes tire troubles. With your car equipped on all four wheels with the A. S. B. all leather, steel studded Tire Protectors, you can figure on from five to ten thousand miles without tire troubles or tire expense.

If you want to take advantage of this First Full Set Introductory Price, write us at once for prices. The first man that orders a full set will get the price, and the agency for 1911.

QUEEN MFG. CO.,

714 Seneca Street, WEBSTER CITY, IOWA.

An Opportunity for Live Agents

Contracts are now being
closed for the full line of
1912 models of

Marion

Motor Cars. Six hand-
some new body styles and
two new chasses. Prices
range from

\$1150 to \$1750

A permanent and profit-
able representation is now
available to established
dealers, also energetic busi-
ness men who seek the
agency for the most popu-
lar high grade motor car.

Write today for full information

CHAS. E. RIESS & CO.

General Eastern Distributors

1776 Broadway, New York City

Loose Bearings.

One kind of a knock, like a heavy thumping or pounding often appears to proceed from the lower part of the engine, and is often quite audible even when the engine is running light with the car stationary. Such a noise can always be taken as an indication of more or less serious trouble, and if allowed to continue it will have a most injurious effect upon the portion of the engine from which the sound arises. The most usual cause of such thumping is wear of the big end bearings. Such wear, when once a little slackness has developed, increases very rapidly indeed, even when the lubrication is perfect. The remedying of such a fault should not be undertaken except by the expert mechanic or a qualified repairer, for the readjustment of engine bearings is a matter that requires careful workmanship, otherwise the last state may be worse than the first. In order to carry out a test for slackness in the big end bearings it is either necessary to take the engine to pieces, or utilize inspection holes in the crank chamber if such holes be present. Further than this the engine should always be slightly warm when a test for slackness is made, for very often the "shake" or vertical movement of a slack bearing is not apparent when a film of thick cold oil is in position between the crank pin and the bearing. The same necessity for a warm engine is apparent when a test for "shake" is being made in the bearings of the crank-shaft itself—for slackness in any one of the main engine bearings is sometimes the cause of a bad knock. The same if not more careful workmanship and experience are necessary when refitting these main engine bearings as in the case of big end bearings, for the job requires great accuracy to ensure a perfect bearing surface.

Choked Mufflers.

In estimating the effect of choked mufflers upon the efficiency of the engine as shown by the power it develops on the road, it is often forgotten that a badly choked muffler is liable to have the effect of causing overheating. This, of course, is only another symptom of inefficiency, but it is not always recognised as such, and those who have taken over cars which have been in use for some time, and regarding which they have no standard whereby to judge the efficiency, may be satisfied with the power developed, and yet considerably perturbed by persistent overheating. If this trouble be caused, as it often is, by a choked muffler the removal of the cause will not only have the effect of stopping the overheating but will add considerably to the power of the engine.

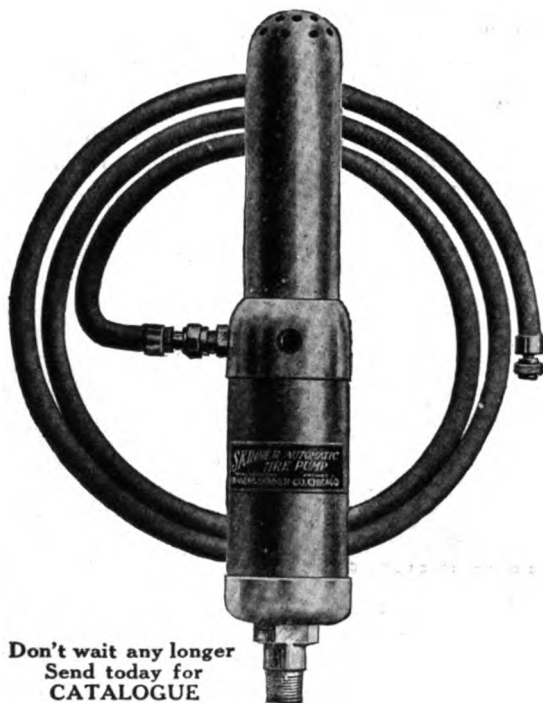
The effect of a choked muffler upon the engine is exactly the same as that caused by a short lift to the exhaust valve, for in both cases the exit of the exhaust gases is considerably throttled, and although the throttling effect in the one case is some distance from the engine, viz., in the muffler, the result as regards overheating and inefficiency of the engine is exactly the same.

To Replace Cylinders.

An easy way to replace automobile cylinders without help or without danger of breaking the piston rings is to disconnect the connecting rods and pistons, taking care to keep account of the shims required for each one, and insert the pistons in the cylinders, and the whole can be easily set in place and the connecting rods fastened from underneath the crankcase.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

STOPS THAT PAIN IN THE BACK



Don't wait any longer
Send today for
CATALOGUE

Your Motor operates this pump which inflates the tire with **Pure Cold Air**. A universal automatic tire pump which can be easily and quickly attached to any size motor.

The most practical power pump on the market—always ready for service.

Remove a spark plug—Screw pump in its place.

Run engine a few minutes until tire is inflated.

Anyone can use it. **SURE RESULTS.**

The Skinner "Pneu-Flator"

A true air compressor of the "step up" type, pneumatically operated by one cylinder of a four-cycle gasoline engine (not operative on the two-cycle type). Silent and vibrationless, producing volume and pressure sufficient to inflate the largest tire with **pure air**.

It pumps the air you breathe, and does not depend on high speed and a flood of oil to obtain pressure and volume. Its pistons are air-cushioned, automatically checking the length of a stroke, preventing wear or damage when pumping against a deflated tire or when changing hose from one tire to another. The device is absolutely fool-proof and non-adjustable.

The price is final. No expense for installation or adapting after purchase of device. Removal of a spark plug and substituting therefor the pump (using the hands only), and disconnecting the ignition of the second plug if dual system is used, is all that is required.

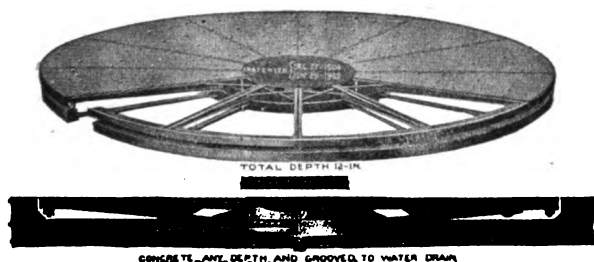
Price \$20.00 each

Pressure Gauge \$3.50 extra

Give name, year and model of car; size spark plug.

SKINNER & SKINNER CO. 1718 MICHIGAN AVENUE CHICAGO, ILL.

"UNIVERSAL" Auto-Turntable Time Tried and Tested



CONCRETE, ANY DEPTH, AND GROOVED TO WATER DRAIN

Concrete any depth and grooved to water drain.

Furnished complete and made in following sizes:

Wheelbase, 108, 132, 144, 156 inches.

Table diameters, 12, 14, 15, 16 feet.

Supporting capacity, 8,000 pounds.

Ball bearing—friction minimized—easily turned—never gets out of order.

A turntable in your garage prevents accidents, lessens your repair bills, saves its original cost in a short time.

BUY THE BEST

Write for catalog and booklet of testimonials. Blue prints and erection directions furnished with table.

The Canton Foundry & Machine Co.

Dept. "G." Canton, Ohio.

THE "AUTO" JACK



The utility of this Jack is apparent at first sight. Built to lift both wheels at same time, fitted with castor wheels, ball and roller bearing. Auto can be moved to any part of garage when elevated on Jack.

This Jack designed to handle heavy weights, is neat, durable and will endure long service.

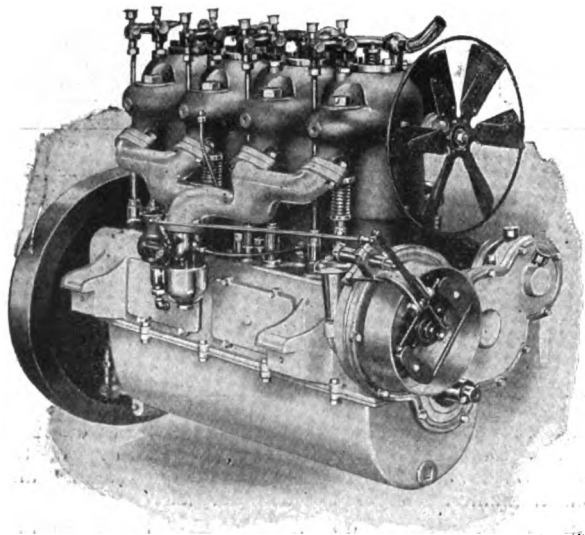
Tongue is used as lifting bar to elevate Jack, or pulling the Jack with its load to any location.

Made with three or four wheels, by

The Canton Foundry & Machine Co.

Dept. "G." Canton, Ohio

Agents Wanted. Write for Prices



No. 11.—Single cylinder, stationary engines, 2 to 125 H. P.

That we furnish engines for farm tractors, railway locomotives and commercial vehicles of all kinds, is evidence of the range of our work and the stability of our construction.

Model Gas Engine Works

Lock Box 2002, PERU, IND.

OUR LINE IS COMPLETE.

WRITE for the following catalogs of the line in which you are interested:

No. 18.—General construction of all motors from $3\frac{1}{2} \times 4\frac{1}{2}$ to 5×6 , cone clutches and transmissions.

No. 20.—30 to 40 H. P. unit power plants with 4 forward speed transmissions and governor.

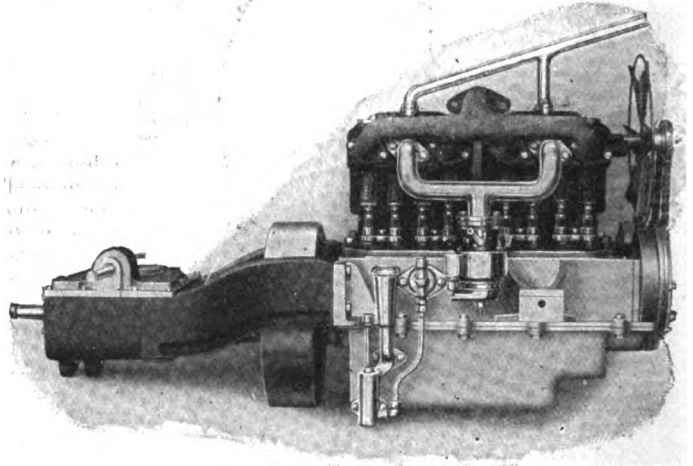
No. 21.—22 H. P. unit power plants with 3 forward speed transmissions

No. 19.—Wells clutch.

No. 17.—4 cylinder, marine engines, 12 to 500 H. P.

No. 16.—4 cylinder, stationary engines, 12 to 500 H. P.

No. 15.—4 cylinder, stationary engines (suction gas type), 25 to 500 H. P.



"The Chain That Lasts"



The
"BEST"
Traction
Chains

Always have been. We intend they always shall be. Infringe NO Patents.

Have not reduced the number of cross chains to lessen our cost. When we can't give an honest chain, we'll quit.

Our Adjuster fits any size chains.

Let us tell you more about our goods and quote you.

H. E. McLAIN & CO.
162 Pond Street, Natick, Mass.

PACIFIC COAST AGENT,

JOHN F. REVALK, 568 Golden Gate Ave., San Francisco, Cal.

His Fulfilled Prophecy.

Just a year ago the late S. H. C. Miner commenting on the high price of crude rubber said:

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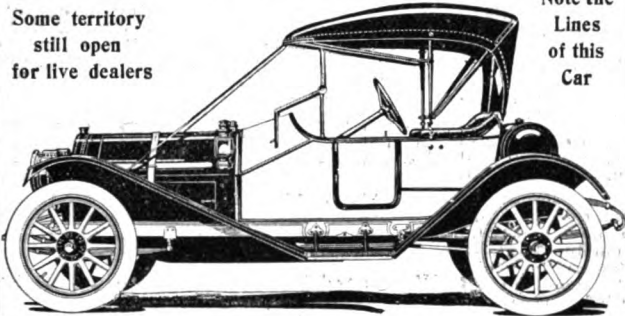
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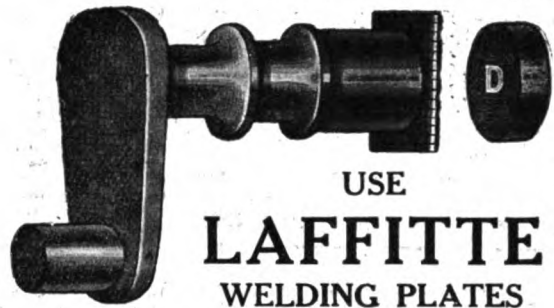
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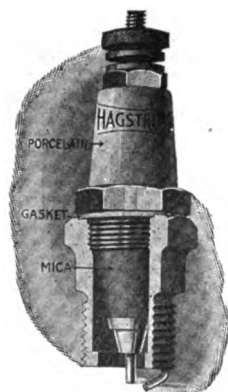
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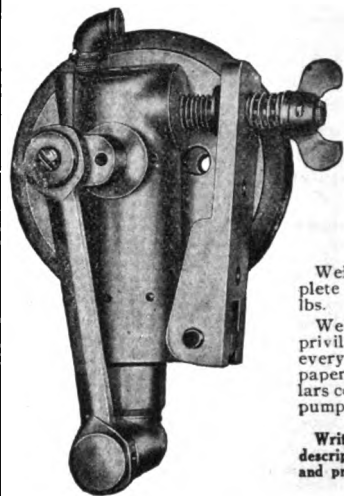
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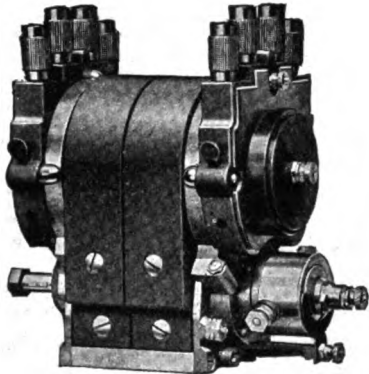
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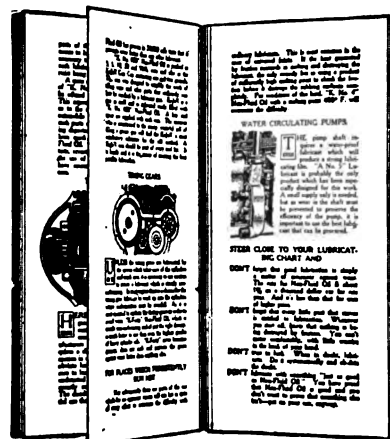
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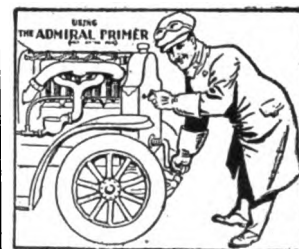
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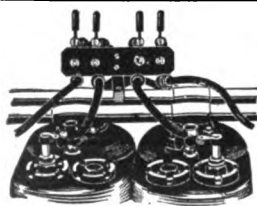
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SPRINGS for all Cars
CARBON OR ALLOY STEELS



Established 1873
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"E," Auburn, Ind., not forgetting to mention this magazine.

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A BETTER PLUG
CANNOT BE MADE
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Manufactured by
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SLIKUP PRESERVES TIRES.

WHITENS THE RUBBER.
ASK YOUR DEALER.

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Address

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Gives uniform, quick-firing mixture

Cuts gasolene cost, 10% to 25%

MIXES GASOLENE

The best carburetors can't do what GYREX does. Carburetors simply furnish a stream of gasolene and air. That's all. They do not MIX it. Hence, you do not get ALL the speed and power.

"BEATS IT TO A FRAZZLE"

Gasolene globules must be diffused—"beaten up"—properly blended with air. You get PERFECT combustion only in that way. The carburetor can't do it. It is not a device for mixing gasolene and air, but GYREX is. It scientifically agitates the mixture—"beats it to a frazzle."

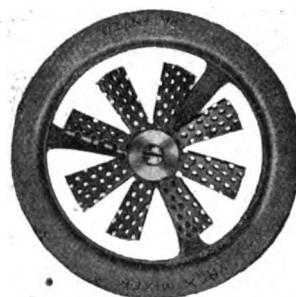
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You get a beautiful mixture. You save nearly a quarter of gasolene formerly used. Flexibility and COMPLETE combustion, and all this for \$3.00. Your money back if you want it. Will you let three dollars stand between you and a sweet running motor? Of course not. Then send for a GYREX to-day.

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PRICE, \$3.00

WE SEND IT ON TRIAL

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STOP TIRE EXPENSE

8 to 14
Hours
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Your
Car is at Rest
Weight of cars
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To cut 5-16, 3-8, 1-2, 5-8, 3-4 inch.
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Schug Ignition and Lighting Batteries

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Write us at once for catalog
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is a well built, mechanical
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Porcelain or Mica.

All Threads.

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Maximum Power—Positive Ignition
Minimum fuel consumption.

Equip your car now and save money.

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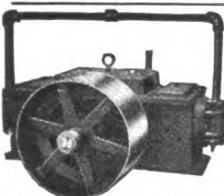
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Several sizes and styles
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Simple and reliable.

Hundreds in use.

Also larger sizes.

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Uautoil WITH ENDURANCE AUTOIL

—FROM PREMIUM PENNSYLVANIA CRUDE

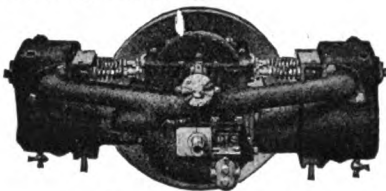
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tested. **ENDURANCE AUTOIL CO., Muncie, Ind.**

The Beilfuss Double Opposed Motor

1910 STYLE

Makes a hit wherever used on
account of its power and com-
pactness.

Can be placed in any car
from the small Olds Runabout to
the larger sized cars.



Made in two sizes:
10-12 H. P. and 18-20 H. P.

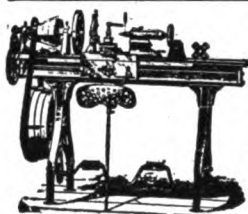
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Write to-day for Circular and Prices.
Simplest and Strongest Motor Built.

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9' swing
11' swing
13' swing

For Repair Work our No. 13 Lathe is right;
has 13' swing, auto cross feed, length of beds
from 5 to 10 feet long; furnished with counter-
shaft or foot-power.

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TUTHILL SPRINGS for Automobiles

THE BEST MADE.

TWO GRADES, (1st) Standard, made of finest high
carbon Automobile steel; (2nd) Special, made of
Vanadium Alloy steel.

We are experts in designing automobile springs.



If you have any trouble with your springs send to
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TUTHILL SPRING CO.,
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"IDEAL" Lawnmower Grinder

Grinds all makes of mowers perfectly in 15
minutes, without removing reel knives. Best
money-maker you can have in your shop. Over
5,000 in use.

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860 Lathe, Gap Lathes, Turret
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Hand and Power Planers, Hand and
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Catalogue Free.

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4 CYLINDER

GETS AT THE HEART OF THE PUMP QUESTION



It is a joy to keep your tires
inflated if you use the
Hawthorne Four Cylinder
Pump.

Why ruin your tires by running flat?

It is so easy to pump them
up now. You'll save money
with the Hawthorne Pump,
by making your tires last
longer.



Easily attached to running
board, and with the six feet
of tubing attached any tire
can be quickly reached and
inflated.

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HAND AIR PUMP

We Light Your Home

or Store—from cellar to garret—with 100 to 700
Candle-Power brilliancy—at less than 1/2 cost of
kerosene (and ten times the light)—giving you
Gas at 15c Per 1,000 Feet
(Instead of \$1 to \$2, which Gas Companies
charge). With the "Handy" Gasoline Light-
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ready at a finger touch—don't have to move
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The brake lining that grips.
Has long life and unequalled friction qual-
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It gives the greatest efficiency and service.

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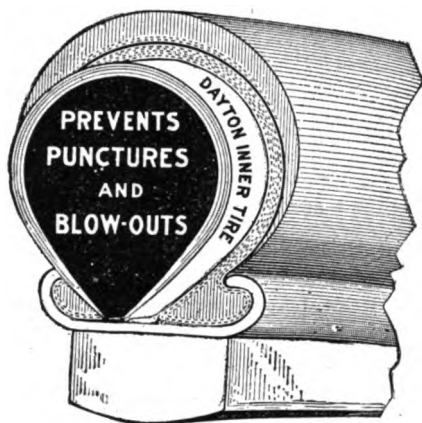
HAD ANY PUNCTURES TO-DAY?

Users of the

DAYTON INNER TIRE

are free from the annoyance caused by punctures and blow-outs.

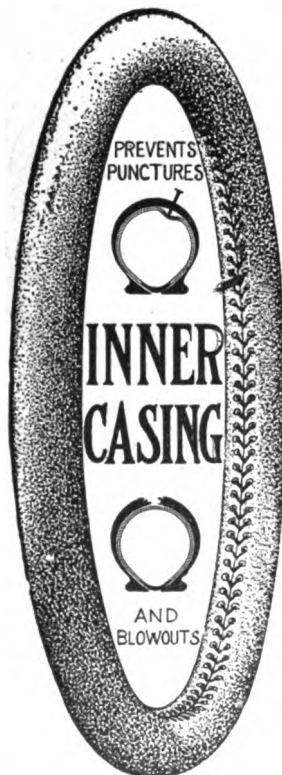
When the DAYTON INNER TIRE is inserted, those troubles simply cannot occur,—even with treads completely worn off the tires.



They're inexpensive—easily inserted and removed. You should use them and put an end to tire trouble. If your dealer does not have them, write for a descriptive price list today.

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HOW TO PREVENT TIRE TROUBLES



Is very clearly and fully explained in our little booklet

"THE CARE AND WEAR OF TIRES."

If you own an automobile, you cannot afford to be without it, as it will help you to

REDUCE TIRE EXPENSE 50% to 75%.

It tells you how to make new tires last 10,000 miles and over. It explains how to wear out your tires without the great annoyance of blowouts, and how to keep your tires in proper repair.

We will send a limited number of these valuable little booklets FREE, postage paid, on request.

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LONGER TIRE LIFE



Keep your tires properly inflated. You can't expect tires to give good service, resiliency and long life if you don't keep them inflated at the right pressure. You will get longer tire life if you use a tire gauge—the famous

ALLEN TYROMETER
TIRE PRESSURE GAUGE



Just press it on valve, that's all. The indication is immediately shown and held by a sliding band which remains fixed until you release it. You don't have to get down on your knees to read it. Large figures. Beautiful workmanship. Price \$1.25. 4½ inches long. Nickel plated. At all dealers or from us.

Allen Tire Covers

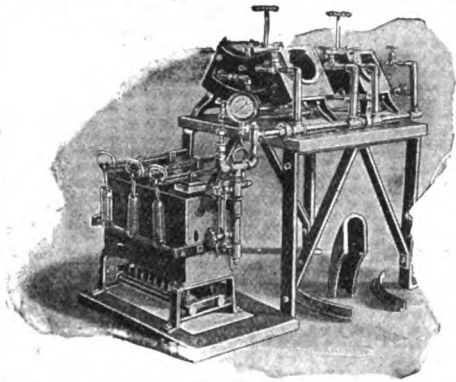
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Minneapolis, - - - Minnesota

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MAKE MONEY REPAIRING TIRES



**COMPLETE OUTFIT. STEAM GENERATED
BY GASOLINE OR GAS.
WE HAVE OTHER STYLES.**

either as part of a garage and general repair business or as a separate venture. Requires very little capital to equip a shop completely with the best tire repairing outfit in the world. The equipment can be paid for and a good profit made by the first season's work. Every motorist must have tires repaired—every motorist in your vicinity is a possible customer for tire repairing.

Get the right kind of equipment—one that produces work that you can guarantee—the Akron-Williams Tire Repair Equipment which was designed by practical tire factory repairman.

Localized heat is the secret of the Akron-Williams. Three separate steam chambers in each of our sections, our exclusive patented feature, limit the curing process to the repaired part.

Proof that the Akron-Williams is the best is the fact that the big tire manufacturers use it—Firestone, Goodyear, Diamond, Republic, Pennsylvania, Revere, Hartford, Consolidated, Empire, Manhattan, Shawmut and many other tire manufacturers are among our customers. They know by experience what is most practical. We can equip a tire repairing plant of any desired capacity. Don't delay getting into this profitable business. Get into correspondence with us to-day.

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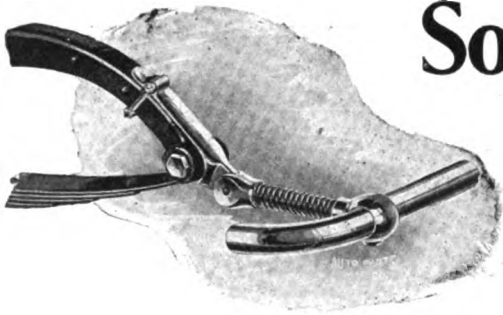
TO MOUNT ON THE BUFFING STAND.

Remove old tread and rough up carcass in a fraction of the time required by other methods.

PRICE COMPLETE, \$12.00.



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The reason there are not more Bumpers used is that owners object to the changing of the spring hanger bolt and drilling numerous holes in the frame.

Badger Spring Bumpers attached to end of side bar as shown in cut, without drilling holes into frame. In case of accident the thrust is against the point of greatest resistance.

The springs are oil tempered and of our own design.

Bar of selected $1\frac{3}{4}$ inch steel tubing, brass covered.

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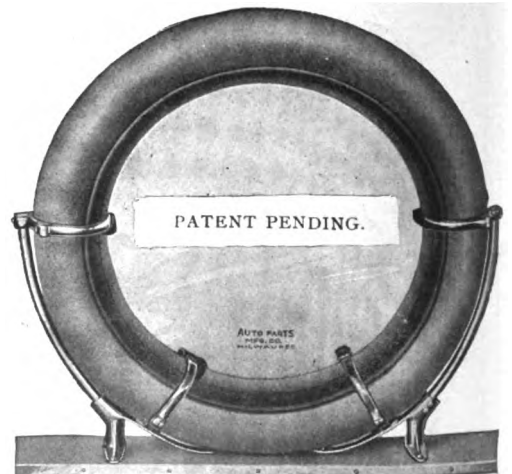
Wind Shields,

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Symphony Horns.

**WRITE
FOR
CATALOG
TO-DAY.**



BADGER TIRE HOLDER

Our Tire Holders can be bolted to the running board of the car, obviating the necessity of boring into the body.

They will hold one or two, three and one-half to five inch tires, and can be equipped with chain and padlock instead of straps, if desired.

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Remy Ignition Supremacy Proven Again and Again in the World's Greatest Speed and Endurance Contests.

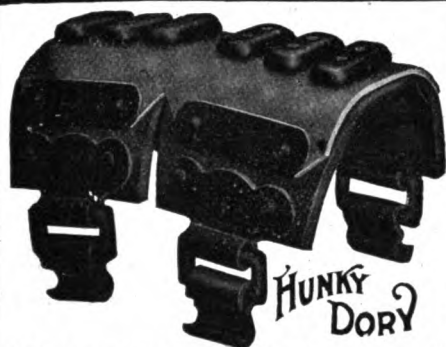
Specify Remy Equipment Upon Your Car



Remy Electric Co.

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HOLDS A HOLE

Better than vulcanizing.
Hooks in clinch of rim.
Stays where it's put.
A few Hunk-Dory patches in the tool box obviates the necessity of extra casings.
BEST, SAFEST, SUREST patch ever made for weak spots or blowouts.
\$1.75 POSTAGE PAID IN UNITED STATES.
Order today.

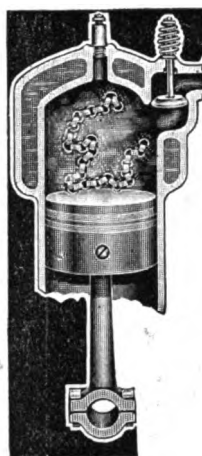
Write for catalogue of sectional protectors. We've got the best protector made. A Hunk-Dory patch will convince you we're right.

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339 E. Washington St.

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Michener Chain Carbon Remover



The Chain Carbon Remover in operation.

The cause of most engine trouble is carbon deposit in the cylinders. The sure signs of it are Fouled Spark Plugs—Loss of Compression—Pounding caused by Pre-Ignition.

Here is a device absolutely guaranteed to remove every particle of carbon from the pistons, top and sides of the cylinders, and mold with the distinct understanding that if not satisfactory to you after trying it your money will be returned.

It saves the expense and delay of tearing down the motor—eliminates disturbing the bearings and adjustments difficult to secure again—DOES NOT scratch or nick the metals, which a sharp-edge tool is liable to do by the old "hand scraping" way.

Price 75c. or 3 for \$2.00

If not sold by your dealer, fill in the order below and mail it to us.

You can clean two cylinders at the same time with Two Chains. *Always state kind of motor, as chains are different sizes.*

**E. S. MICHENER, 800 Washington Street,
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Please send by return mail, postpaid,.....Michener's Chain Carbon Removers for use in.....Motor. Enclosed is \$.....

It is understood that you are to refund this money if I am not pleased with the device after using it.

Name.....

Street.....

City and State.....



Baldwin Chain and Mfg. Co.

makes automobile chains both riveted and detachable—all sizes in stock.

SPROCKETS

Sprockets made to order.

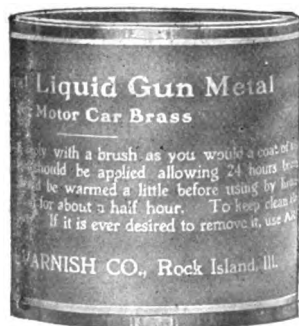
We carry in stock sprockets for the following cars: Cadillac, Reo, Buick, Brush, and Chase Motor Truck.

Send for Quotations and Circulars

Baldwin Chain & Mfg. Co., Worcester, Mass.

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Mr. M. A. Bryte, 788 Mission St., San Francisco, Cal.

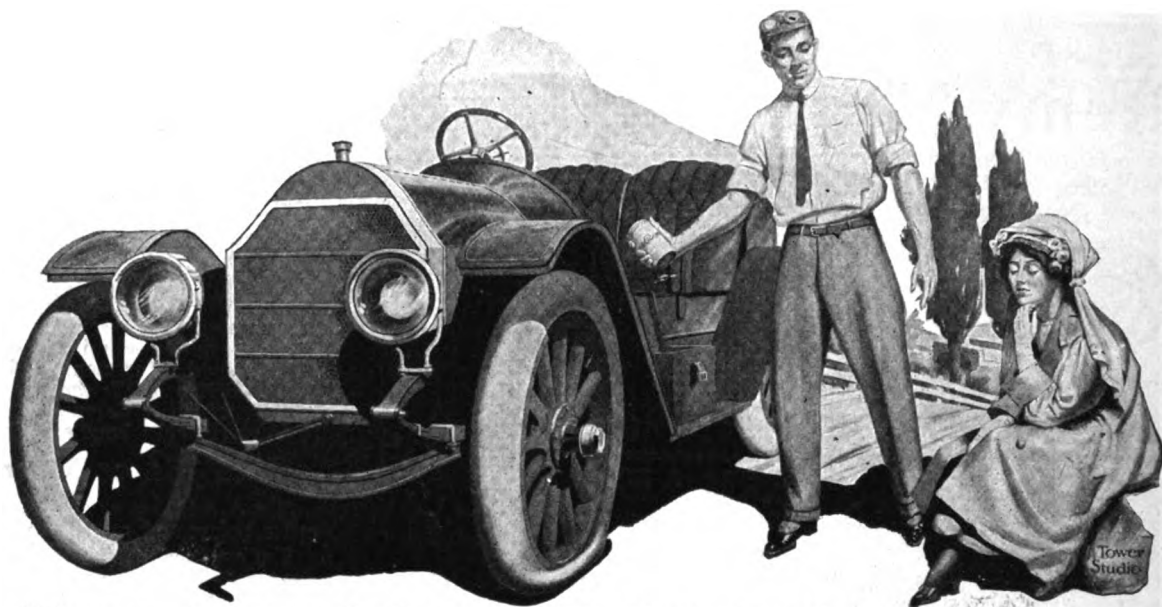
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With Arsenal Liquid Gun Metal on your lamps and radiator you have no polishing to do. It is applied with a brush the same as paint or varnish and makes a lasting gun-metal enamel on all brass parts. Can be removed at any time without injury to the brass. Have you ever seen a steel blue revolver? Well, that is the color of Liquid Gun Metal. Used and endorsed by thousands of motorists. If not at your dealer's \$1 brings a can express prepaid. Liquid Gun Metal is the standard material for enameling motor car brass. Don't pay a painter \$75 to paint your car. Do it yourself with the Arsenal system. Ask us how.

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"Cheer up, dear, I can fix that puncture in 15 minutes with this Tire-Doh Outfit."

It's as good as *forty* inner tubes for insurance against delays and ruined tires. You can repair a puncture with **Tire-Doh** almost as quickly as you can put in a new tube. *Vulcanizing is not required*, **Tire-Doh** "cures" itself *instantly* and makes a *permanent* repair as tough and elastic as the tire itself. Money back if you ask; it is our guaranty of your satisfaction. Over 75,000 **Tire-Doh Outfits** sold to date and only 27 requests for money back.

With your two hands can *permanently* repair *every* tube or casing—puncture. Remember our guaranty. and better than by vulcan-



promptly repairing casing injuries with **Tire-Doh** you can get *double* the usual mileage. All this—and the **Outfit** costs only \$2 of your dealer or direct of us express prepaid.

and a **Tire-Doh Outfit** you *injury* that can happen to a blow-out, cut, any injury. You can do it easier, quicker *izing at one-tenth its cost*. By

Will You Try a TIRE-DOH OUTFIT at Our Risk?

Then tear out the Coupon below as a reminder to ask your dealer for a **Tire-Doh Outfit**. If more convenient we will ship one *direct* to you express prepaid upon receipt of price, \$2. *Any time* you would *rather* have your money back you can get it *instantly* from your dealer or from us and *no questions asked*. You run no risk. Tear out Coupon NOW.

Tear out This Coupon NOW as a Reminder.



This shows the **Tire-Doh Outfit**—one can **Tire-Doh**, one can **Tire-Doh Cement** (enough for 40 punctures), and one **Inside Casing Patch** for blowouts. It comes neatly packed in a can or mailing tube. Price, \$2, of your dealer or direct from us by express prepaid. Money back on request.

ATLAS AUTO SUPPLY CO.,
77 EAST ADAMS ST., CHICAGO, ILL.

Auto Supply Dealers Read This.

If we have no dealer in your town we can make *you* a proposition that has never been made to you by *any* manufacturer. Write us *now* for details. Hundreds of dealers are selling two or three dozen Outfits a week. If you have never seen a **Tire-Doh Outfit** we will send you the regular \$2 Outfit, *express prepaid*, upon receipt of your check for \$1.50, *if you write us on your business letter-head showing you are an auto supply dealer*. We will also return your money if you ask it. Don't waste time "pooh-poohing" **Tire-Doh**. Every word of this ad. is *true*. Write us *now*.

ATLAS AUTO SUPPLY CO.,
77 EAST ADAMS ST., CHICAGO, ILL.

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Buy Gasoline and Oil at Barrel Prices

All that is necessary is a

\$10

Geyser Gusher



Will empty a barrel of any oil or liquid in the least possible time, practically without effort. Illustration shows how it works. Screws into bung or any barrel or oil tank (standard threads). Attach your tire pump to Schrader valve at side of plug as shown and pump air into barrel, which forces oil out of spout. It gushes forth in steady stream, many times faster than any pump can draw it. For transferring any liquid,

oil or varnish, the Geyser Gusher is easily worth twice its price to any car owner, garage, machine shop or factory where liquids must be transferred. Saves on buying and labor, reduces fire risk and prevents waste.

Let us send you a Geyser Gusher on 30 days' trial

Upon receipt of \$10. we will send a Geyser Gusher anywhere in the United States, express prepaid, and refund money if returned to us within 30 days. Write your check now, and while you're about it, make it for \$15 and let us send you a

Pitner Pump

on the same terms. You risk nothing. The Pitner Pump is the easiest working, longest stroke, most efficient hand pump for tires. It is **guaranteed** for 5 years' satisfactory **service**—and **gives** it. The only pump so guaranteed. Send us your check **now** for a Geyser Gusher or a Pitner Pump—or **both**. Try them 30 days, and if you would rather have your money back, just telephone the express company to call for them and you'll get your money back as quick as Uncle Sam can bring it. You run no risk. Send your check now to

PITNER PUMP CO.

1214 South Michigan Avenue,

CHICAGO, ILL.



Master Vibrator For all cars using vibrating spark coils, and **ESPECIALLY FOR FORD CARS**

You will never know how much speed, power and flexibility there is in your car until you try a K-W Master Vibrator.

It takes the place of the separate vibrators on your coil, giving you one fast vibrator and powerful condenser for all of them, thus giving absolute synchronism, with a smoother running engine and **MORE POWER.**

Try it 30 days, if for any reason you don't want it, return it and get your money back.

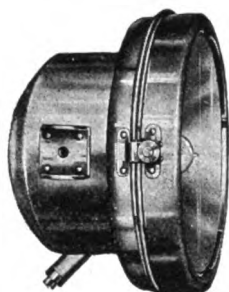


PRICE, \$15.00
EXPRESS PREPAID.



Electric Road Lighting Outfit

"The Successor to The Gas Tank"



Current Direct from Magneto

THE K-W ROAD LIGHTING OUTFIT—Low Tension Belt or Friction Drive Magneto, pair of Head Lamps, Switch, Wire and Bulbs, all complete for **\$50**

THE SIMPLEST ELECTRIC LIGHT OUTFIT IN THE WORLD.

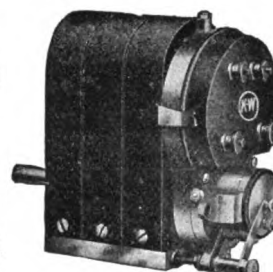
NO Storage Battery to Sulphate or Short Circuit.
NO Commutator or Brushes to make Trouble.
NO Complicated Cut-Out to go wrong.
NO Delicate Ammeter or Voltmeter to lie to you.
NO Complicated Electrical Connections and the PRICE is right.

SPECIAL ELECTRIC LIGHT OUTFITS **\$18**
FOR FORD CARS



High Tension Magneto

Model J
Guaranteed to Start Auto Engines up to 30 H.P.



No Coil
No Timer
No Batteries
4 Cyl. \$50.00
6 Cyl. 55.00

Extremely simple—nearly half less parts than any other Magneto. Perfectly reliable.

We make larger Magnetos for larger engines.

If you cannot gear-drive a High Tension Magneto, use one of our \$35.00 Low Tension belt or friction drive Magnetos, and a K-W Spark Coil. Low Tension Magnetos run Electric Lights. High Tension Magnetos are for ignition only.

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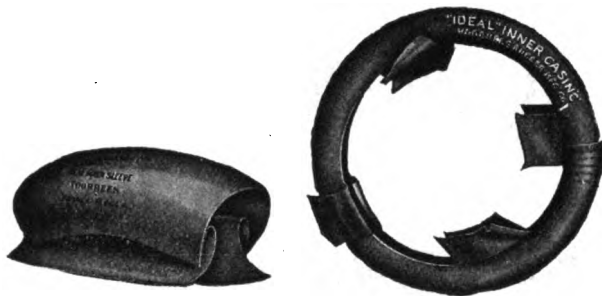
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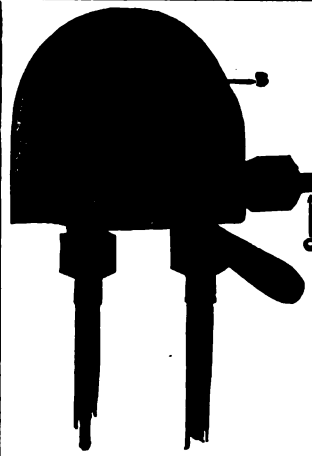
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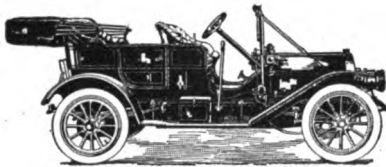
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No roads are too heavy, no hills too steep for the Cartercar. It's the car that gets you where you want to go, and just the time you want to be there, too.

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Requires no heat, as Cement and Vulcanizing Solution unites patch and torn parts into one solid piece of rubber that cannot be separated without tearing.

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QUICK OPERATING



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Notice the Name, "MOTOROPE." Beware of Imitations.

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Here is a new and necessary device to test the compression in your cylinders. Screw into spark plug opening and turn fly-wheel around once. The red hand indicates the exact compression. Price of Compressometer \$4.00, complete, with 3 bushings. Metric A. L. A. M. and 1/2-inch. Dealer's discount 25% off, or \$3.00, net.

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Of various well-known makes at extremely low prices.

Absolutely New 1911 Imperial Tires
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30x3½.....	13.50	35x4.....	18.75
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Not many left just now
but if any of the following
fit you, then here's your op-
portunity for a real bargain
in this superior make of tire.

32x3.....	\$11.00
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(Samples on Request.)

28x3.....	\$2.75
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34x3.....	3.95
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31x4.....	4.20
32x4.....	4.40
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34x4½.....	5.20
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NOVEL!

CAN'T BLOW OUT

ELECTRIC REAR (or tail) LIGHT

Designed to be attached to number plate or body of Car.

Can be Connected to Sparking Battery

This light meets with all the requirements
of the Mass. Highway Commission and
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Write us for Full Particulars

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THIS little book was written especially
for beginners. Either the man who
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but who has not time to study a technical
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It gives full details in connection with
running gasoline engines, stated in simple
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The RHOADES' UNIT SPARK SYSTEM

represents the foremost advance in ignition. The simplicity and ease with which this Spark System is installed is one of its most commendable features. (A screwdriver and pliers are the only tools required.)

While this system depends on dry cells for its operation, do not compare it with any other battery system. Six cells will carry you 2,000 to 4,000 miles and over without replacement of batteries. This marvelous battery economy is due to the fact that the ordinary battery and coil system eats up a large portion of current in the opening of the circuit, which is accomplished by magnetic means. The Rhoades' Unit Spark System is mechanically operated and therefore requires no timer vibrating coils, delicate relays, etc.

An intensely hot igniting spark is furnished whether the engine is running one revolution or 2000. Impossible to stop in contact and a button is provided for starting on the spark.

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In writing state make of car, size of time shaft, direction of same, and number of cylinders.

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MR. DEALER

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We are Manufacturers and Jobbers, selling to Dealers only and we carry a Complete Stock.

We shall be pleased to receive your request for Catalogue and to have one of our Salesmen call on you.

NOTE: If you are not a dealer do not ask for the 1911 book.

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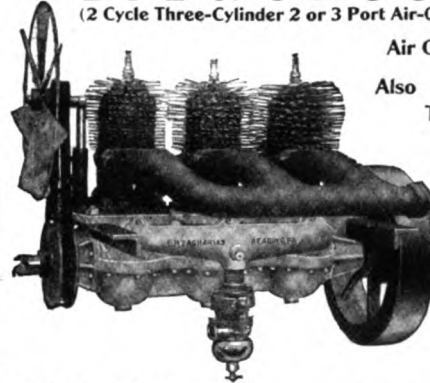
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THE 2-3-2 or 3 A-C-C ENGINES

(2 Cycle Three-Cylinder 2 or 3 Port Air-Copper Cooling Engines)

Air Cooled 20-22 H.P.

Also Made in One and Two Cylinders.



Construction is simple, durable, absolutely reliable, and smooth running.

All work thoroughly tested, and perfect satisfaction guaranteed.

Write for catalogue and information

E. H. ZACHARIAS, - - 121 Washington St., Reading, Pa.

The TRIPLE TREAD



is the only tire protector which protects your tire and cannot injure it in any way.

Being firmly vulcanized to your casing it cannot creep, heat, chafe or allow sand and dirt to work under it.

**Doubles tire mileage and prevents punctures and skidding.
Write our nearest factory for full particulars and prices.**

TRIPLE TREAD MFG. CO.

1542 Michigan Ave., Chicago 542 Van Ness Ave., San Francisco
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RUBBER PUTTY FOR TIRES

*The Greatest Invention of its Class.
A True Money Saver and a Protection to Life and Limb.*



RUBBER PUTTY

Prevents blowouts, avoids sand blisters, saves fabric from decay, keeps out water, causes tires to wear out evenly and smoothly.

Requires no cement, will vulcanize itself, is applied in 5 minutes, does not soil the hands. Saves over \$50 in the season.

Gives safety in speeding.

FULL SIZE CAN, POST PAID, FOR \$1.25.

Send at once for booklet giving further particulars and prices.

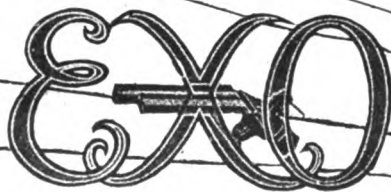
**THE TOLEDO AUTO DEVICES CO.
709 GARDNER BUILDING, TOLEDO, OHIO**

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TRY IT 30 DAYS FREE



MAKES A CLEAR STRONG
SIGNAL FROM THE
EXHAUST OF THE ENGINE

If not satisfied, return and
we will refund the money

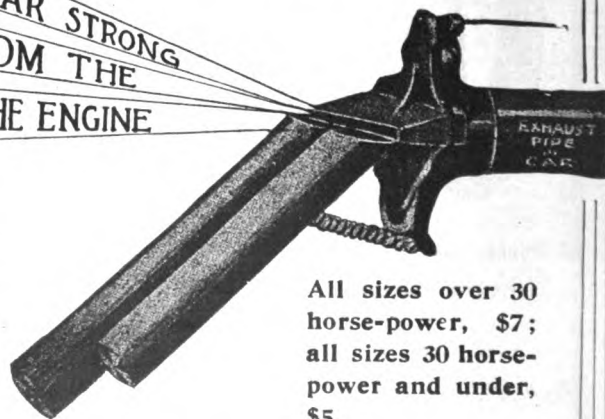
We are anxious to have **you** test the EXO signal, hence this generous offer. No matter what horn you now have you need an EXO. LOUD but not HARSH.

INEXPENSIVE INDESTRUCTIBLE INDISPENSABLE

TROY AUTO SPECIALTY CO., TROY, N. Y.

TROY AUTO SPECIALTY CO., Troy, N. Y.
Gentleman:—Enclosed find \$..... Ship via express, prepaid, "EXO"
for Make of Car.....Model.....Year.....
If I am not satisfied after a fair trial of 30 days, I may return the signal
and you will refund my money.

A. D. R.



All sizes over 30
horse-power, \$7;
all sizes 30 horse-
power and under,
\$5.

Attach it yourself in 15 minutes.

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TIRE PROTECTION WITH A GUARANTEE

Yes!—I mean every word I say, when I guarantee you 10,000 miles service on every 1911 "BRICTSON" Heavy Car Type Tread, and I will positively make good my guarantee. I have been studying this tread proposition for the last six years and have devoted the best of my life in perfecting this wonderful tread. Yes! Wonderful, that is just what I mean and I am not afraid to look you square in the face when I say it.

Mr. Motorist, you cannot afford as a matter of economy, to run your car without using the 1911 "BRICTSON" Detachable Heavy Car Type Tread, when I am offering you a guarantee of

10,000 MILES

WRITE FOR A COPY OF MY GUARANTEE

Let me prove it to you by the hundreds of letters in our files from satisfied customers that are just as enthusiastic over BRICTSON DETACHABLE TREADS as I am. While dictating this advertisement to my Edison Business Phonograph, a letter from one of our customers was laid on my desk, which letter all must be compelled to believe, for it was absolutely unsolicited and from a man with a high moral standing, as his calling will indicate. The letter reads as follows:—

METHODIST EPISCOPAL CHURCH,
Rev. L. S. McKown, Minister.

O. A. Brictson, Pres.,
Brictson Mfg. Co., Brookings, S. D.

Vienna, Ill., March 15, 1911.

Dear Sirs:—I have been using the Brictson Tread on a Buick car for over two years, and I find that they give entire satisfaction. Since coming to this city I find every other Tread except the Brictson, and I am desirous that my friends get the best, hence I write for the agency, and your best net prices. And in order that I may be the first in the field here, please ship me by return Express, one set (4 Treads) of Brictson Detachable Tire Treads for tires 32x3 1/2. Ship C. O. D.

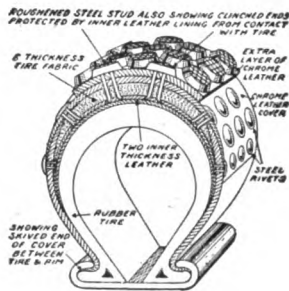
Yours Very Truly, (Signed) L. S. McKOWN,

Right here I want to say that the treads referred to in the above letter were made two years ago, when we were in the experimental stage, and which goes to prove even though our treads were not perfected at the time, the principle was absolutely right. Think of a man running a car equipped with the same tires for two long years, all the while under "BRICTSON" DETACHABLE TREADS, and then ask yourself, "Do they rot the rubber tires?" I want to tell you, gentlemen, that this rotting, heating, burning, creeping, stretching, and injuring the rubber casing that you have heard so much talk about is all "bosh" with the Brictson, and I can prove it, not only by the above unsolicited letter, but by hundreds of others, copies of which will be gladly forwarded upon request.

Brictson Detachable Tire Treads

"The Enemy of Tire Expense"

The cross section illustration on this page represents the construction of the BRICTSON Heavy Car Type Tread. First there is a layer of specially tanned, extra pliable chrome leather. On the tread part outside of this leather is another strip of chrome leather, which entirely covers the tread surface that is exposed to the road. Next to these two thicknesses of leather are five layers,—did you get that?—five layers of the very best quality tire fabric. It would be an easy matter for us to use one, two, three, or even four layers of tire fabric in order to save money, but we have found from years of experience that it is absolutely necessary to use not less than five layers of the tire fabric to obtain perfect strength and to prevent the tread from stretching, that is why we use five layers of tire fabric. A tread made without sufficient fabric would be worthless on account of stretching, causing it to sag and become loose on the rubber casing. That is why all rubber casings are rivets are clinched into another layer of leather which immediately follows next to the tire fabric, and then there is yet another layer of chrome leather, which covers the clinched ends of the studs and rivets and prevents them from coming in contact with the rubber tire.



Is there any wonder then that users of "BRICTSON" DETACHABLE TREADS say they are the best tire protectors in the world? And you must certainly admit it after you have read and studied the foregoing construction and illustrations.

TO DEALERS

We are going to establish an exclusive agency in every city and town and have a very interesting proposition to offer. Fill out and mail coupon to the left and immediately upon receipt of same I will mail you my new 1911 catalogue together with my exclusive agency proposition and contracts for your approval. Don't delay! Write today, for we give only one exclusive agency in each place.

O. A. Brictson,
President,
The Brictson Mfg. Co.,
181 Brictson Bldg.,
Brookings, So. Dak.
Without obligation on my part,
send me your exclusive Agency Propo-
sition, 1911 Catalogue and Dealer's Folder.

Name.....
City..... State.....
County.....

O. A. BRICTSON, PRESIDENT
The Brictson Mfg. Co.
131 BRICTSON BUILDING
Brookings, South Dakota

MOTORIST'S COUPON.

O. A. Brictson,
President,
The Brictson Mfg. Co.,
181 Brictson Bldg.,
Brookings, So. Dak.

I am interested and would like to know more about "Brictson" Detachable Treads. Send me your booklet, "The Enemy of Tire Expense," Proofs from Automobile Owners, Prices, etc.

Size of Tire.....

Name.....

Address.....

Dealer's Name.....

SPECIAL NOTICE

CONCERNING

K & W PATENT RELINERS

To Consumers, Dealers, Jobbers and Tire Repair People.



Reg. Applied For.
Above shows K & W Reliners strengthen tires so much that they may be worn entirely through without having blow-outs.

The K & W Patent Reliner

was "the first successful reliner" ever manufactured, and is, and always has been, made of a better quality of material than any imitation or infringement.

Remember, The K & W Patent Reliner is Fully Guaranteed.

TIRE REPAIR PEOPLE everywhere are using K & W Patent Reliners in their repair work, which proves they are a good thing to strengthen weak tires.

We guarantee K & W Patent Reliners to eliminate your tire trouble and tire expense and agree to refund money if reliners are not satisfactory in every way.

You might be surprised to know that there are nearly 25,000 K & W Patent Reliners in successful use at the present time.

EXHIBITED

At the New York and Chicago Shows, also at Boston, Minneapolis, Washington and Kansas City.

**Be sure you get a K & W
IT'S BEST.**

For sale by nearly all dealers, jobbers and tire repair companies. If your dealer does not have them, write us **AT ONCE** for our Proposition on a Trial Order.

K & W MFG. CO. 3rd St., Ashland, Ohio.

Please mention the Automobile Dealer and Repairer when writing to advertisers.

As manufacturers of K & W Patent Reliners, which are sometimes called Inner-Shoes, Inside Tire Protectors, Inner-Tires or Tire Reinforcements, we are pleased to advise you that we own, **EXCLUSIVELY**, patents which are basic and which cover the reliner thoroughly. What the **SELDEN PATENT** is to the gasoline automobile—our patents are to the successful inside tire protectors.

No doubt you are aware that there are several imitations and infringements on the market, the manufacturers of which claim to have "something just as good." Our reliners are semi-cured; a feature which is covered by patents. Under-cured reliners tend to become cured by the heat generated by the friction of the tire on the road, while full cured reliners would become over-cured and deteriorate rapidly. This is why semi-cured reliners remain soft and pliable and are of long life.

The K & W Patent Reliner is coated with a vulcanizing compound which causes it to adhere firmly to inner walls of tire. Thus, it will not creep or generate heat by its use. This feature is also patented. Patents "also" cover coating inside of tire with a vulcanizing compound before applying Reliner.

Therefore, when anyone offers you a semi-cured or cement coated reliner by whatever name called, they are imitators or infringers unless the following dates of patents are stamped on inside of reliner:—"Dec. 28th, 1909, and Jan. 4th, 1910." Evidence is being secured against infringers and prosecutions will follow.

Why should you purchase these imitations and infringements when you can purchase the original "patented" reliner at no greater cost?



The above picture is no exaggeration. Note the following: Your "picture frame" or "collar" tire with man's head through it is no worse than the one that I had on my car, and it never blew out after the Reliner was put in.

Yours truly,
F. LEE ROGERS, Auburn, N. Y.

